

# BRITISH JOURNAL<sup>OF</sup> PHOTOGRAPHY

# ANNUAL 1980



*The British Journal of Photography Annual* 1980 is the 120th issue of the world's oldest photographic yearbook. To open the new decade it comes before the public, both established readers and the new friends it wins each year, in a new shape. Since 1964 when it made its last major change, the world of photography has moved on and with it the design of books showing pictures. The new squarer shape enables us to display the image formats mostly used by contemporary photographers to much greater advantage, making for a more attractive and meaningful presentation. Regular readers will not feel deprived however, since the 1980 edition retains the unique features which, together with the picture section, have made this *the* book for all photographic enthusiasts, whether amateur or professional. Only in it can be found the formulae for processing almost all the available black and white and colour films used in photography. As well as this there are feature articles covering an important contemporary photographer who specialises in portraits, and a photojournalist of the older school whose work is now being rediscovered. This year the historical retrospect traces the development of aerial photography, and of course the traditional articles bringing readers up to date with progress in various photographic fields are still here in the new book. When you add to this the unique directory of organisations, magazines, societies and so on, from whom you can obtain almost any kind of photographic information you need, we think you will find the book maintains its 120-year-old reputation of the photographer's indispensable companion.

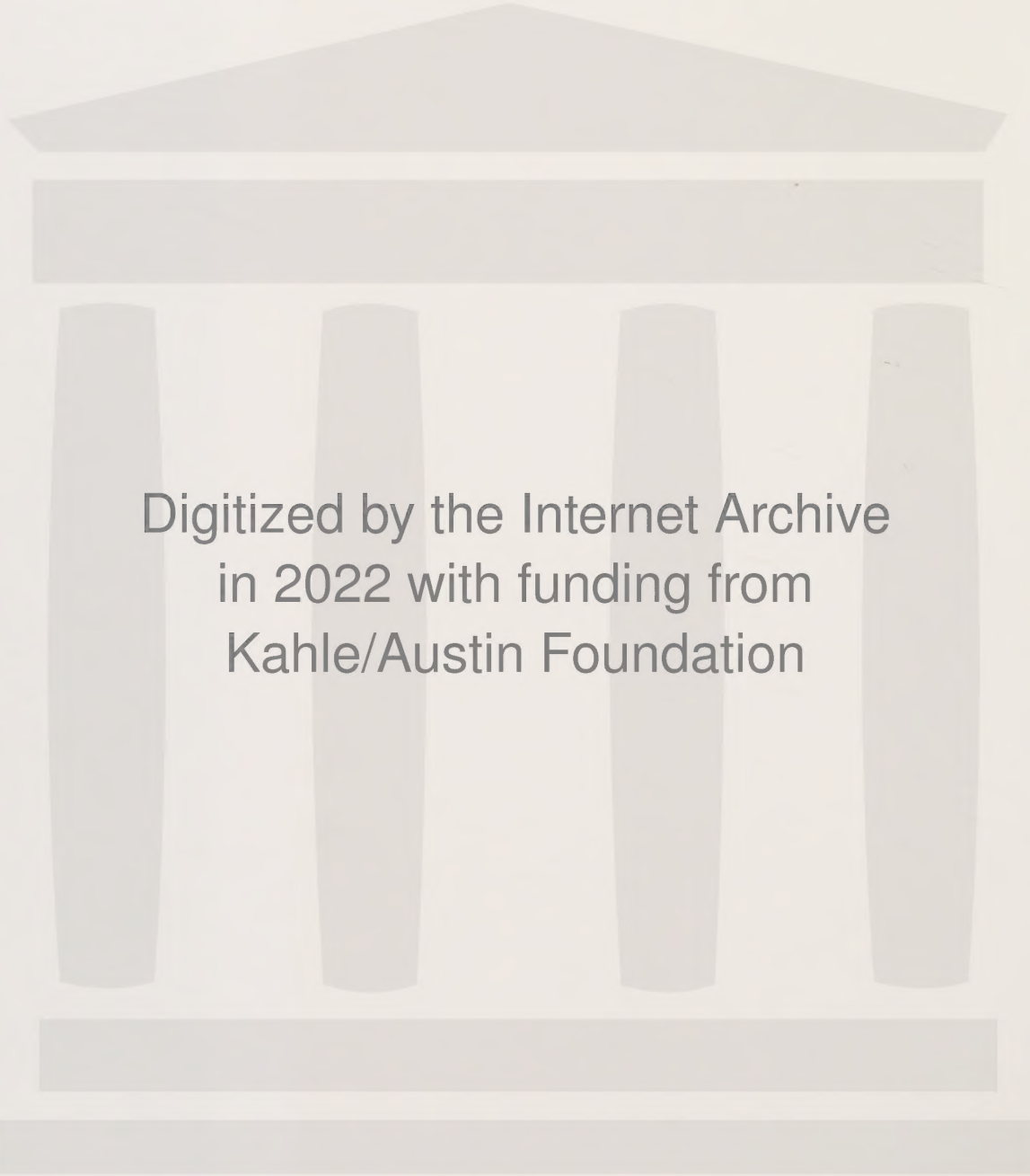
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**ANNUAL1980**



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**ANNUAL 1980**

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### Successive Editors of the Annual:

1861–62	Samuel Highley
1863	James Martin
1864	Emerson J. Reynolds
1865–79	J. Traill Taylor
1880–86	W. B. Bolton
1887–96	J. Traill Taylor
1897–1905	Thomas Bedding
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1935	{ H. W. Bennett P. C. Smethurst
1936	{ H. W. Bennett Arthur J. Dalladay
1937–67	Arthur J. Dalladay
1968–	Geoffrey Crawley

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1969	{ Anna Körner Geoffrey Crawley
1970–71	Anna Körner
1972–73	Mark Butler
1974–76	Anne Owen
1977–78	Judy Goldhill
1979	Geoffrey Crawley
1980	Jan Turvey

### The Annual's History

The British Journal of Photography Annual is the oldest photographic yearbook in the world. It appeared first in the form of a wall calendar for the year 1860 and was published as a supplement to *The British Journal of Photography* issue of 15 December 1859. In the following year the *British Journal Photographic Almanac*, 1861, as it was then titled, with the sub-title *Photographer's Daily Companion*, appeared as a pocket book, 4 x 2½in in size, issue free of charge to subscribers of the *Journal*. The 1886 issue was produced in the Crown 8vo format, 4¼ x 7in, and sold as a separate publication with 118 pages of text and 44 of advertising, priced 6d. This format remained unchanged for 97 years until the 1964 issue, when the book was enlarged to 8 x 11in, enabling photographs to be properly displayed, selected by a picture editor, also responsible for the layout of the book. With this, the 1980 edition, the book adopted a new, 255 x 240mm, format. Some of the reasons for the change are given in the Editor's foreword.

# FOREWORD

As the reader will have noticed, the first *British Journal of Photography Annual* for the 80s has changed in format but not in intent. It is a sign of the quickening pace of change that although the first *Annual* format lasted for 114 years, its second format was maintained only for the comparatively shorter 16 years. The present squarer shape cannot be claimed as an innovation in photographic publishing: it implements the trend which has grown over the last five or six years. The reasons for this are interesting since they stem not from any change in not only the rationale of book production but also from developments within photography itself. The improvements in photographic materials and lenses had by the early 70s brought the 35mm camera into very much wider use amongst professional photographers, in applications where hitherto a medium format rollfilm camera would have been used. At around the same period the re-emergence in modern terms of the Victorian concept of fine art photography saw its exponents generally using 35mm. When you add to this its universal use by the social documentary and reportage photographer, it has to be said that the 35mm camera accounts for the vast majority of pictures published.

To cap it all, the 70s saw the development of the trend that the 35mm photographer must use the whole of the frame for his picture, with it frequently printed occupying the centre of a large sheet of paper. This obsession is a little baffling to some of us since the 35mm format came about, not from any artistically inspired motivation, but because Barnack, when designing the Leica, found it convenient to double the standard movie frame.

These introductory points have been made because they explain why, during the late 70s, books of photographs have gone over to a squarer shape. A tall, thin book restricts the full display of horizontal, full-frame 35mm pictures in width and the height forces the designer either to make strange and cramped bedfellows of pictures or leave unsightly acres of white space. Apart from such pictorial aesthetic considerations, the new shape allows greater unity of design and a more easily viewable book.

The last decade started with great optimism that the fruits of the many liberalising movements and trends of the 60s would flower in a climate of economic prosperity. However, the sense of affluence which grew up in the late 60s and hung over into the beginning of the 70s had by 1974 been shown up as the vast flare-up of a dying fire. The world recession wiped the smile off our faces and the 70s progressed with the growing anarchy and violence which personal frustration and economic depression can so easily bring. Photography itself remained in surprisingly good heart and although many operators found a purpose in their work outside photography itself, by documenting and sometimes tendentiously commenting on what was going on around them in their pictures, it was the same period which showed the re-emergence of the fine art worker. Indeed, social historians may one day point to this as a form of escapism. Others may see it as an escape, not from grim social and economic realities, but from the narrowing down of photographic endeavour by the commercial demands made on the craft. The 60s

had been a period when the photographer with flair could dictate to designers, account executives and art directors, carrying them along with the force of his personality and conviction. In the 70s, inspiration was replaced by perspiration and tighter budgets and more careful and skilful planning by art directors increasingly subjugated the photographer to implementing their requirements. Similar changes occur in other areas where hitherto the photographer had been able to express his individuality and make something more of the picture than the bare content he was required to show by the buyer. These constraints probably contributed much to the dropping out of the commercial field as an aim for many young photographers and the re-direction of their energies, prompted by a number of successful operators, into the fine art world.

It is the fashion amongst professionals who must regularly earn their daily bread to regard the movement with some derision, and it is certainly true that it contains its fair share of pseudo work. We adopt a different view, remembering the beginnings of photography, and deriving encouragement that even in this most regimented of ages, there are those who stand out for individual and self-expression. Neither are they totally uncommercial, since the growth of the movement has been aided, not to say abetted, by the fringe art world selling photographs as art objects, as they would paintings and sculpture. Carried this far, the ethics become more debatable but the mushroom growth of galleries exhibiting photography must have the effect of widening public appreciation of the photographer and what the process can achieve. This in its turn has without doubt reflected back to the advantage of the professional photographer's status. Hardly surprisingly, the re-emergence of fine art photography has been accompanied by an intense interest in the work of earlier photographic masters and in the history of the process itself.

This then is the atmosphere in which photography enters the 80s. What this decade will bring to its culture is, happily, only a guess-estimate. Britain – and with today's close interlinks that means the world too – is entering the most significant period of social, industrial and economic change since the Industrial Revolution and it is likely to come about a great deal more rapidly. So much depends on our ability to be far sighted and prepared to make the necessary adjustments in time. We can at least be sure that photography will be there documenting the revolution. As a process, the 70s saw its virtual perfection and electronics, the in-word of the 70s, has little more to offer the traditional process. Although the 80s will see other methods of imagery taking over in many fields, there is at the moment little prospect of the heart land of photography moving away from the silver process we all love.

Here, then, is a new style *Annual* for a new decade but in essence it remains the same in purpose as ever: a collection of imagery and words which we are confident form essential perusal for all those interested in what photographers are doing – now.

*Geoffrey Crawley, Hon FRPS, DGP, MBKSTS,  
September 1979*



# PICTURE SECTION



JAN SVOBODA

# FOREWORD

The aim of the picture section in this 1980 Annual is threefold.

Firstly to celebrate traditional methods and styles of photographic picture making at their best. Secondly to introduce new work by photographers, who, having built upon past traditions, have evolved a fresh and exciting approach to using the medium. And thirdly to show some of the more experimental uses of photographic materials by photographers in exploring ideas, form and colour.

Of the work included some is by well established professional photographers, but in general I have aimed to include work by relative newcomers which I considered to be innovative and accomplished and which showed evidence of a strong depth of intent.

The selection is of course a personal one, and should be considered as such. Its success or failure in representing contemporary photographic picture making can and will only be measured some years hence when we can look back at the various ways in which photographs have contributed to our ever growing visual vocabulary.

As for the present, I can only thank all the photographers who have contributed to this 1980 Annual and also all the photographers whose pictures I have not included, who took the time and trouble to send their work for consideration, and invite you all to submit new work in the spring for our 1981 edition.

*Jan Turvey MARCA  
September 1979*





BARRY LEWIS



BARRY LEWIS



BARRY LEWIS



BARRY LEWIS



PETER MARLOW





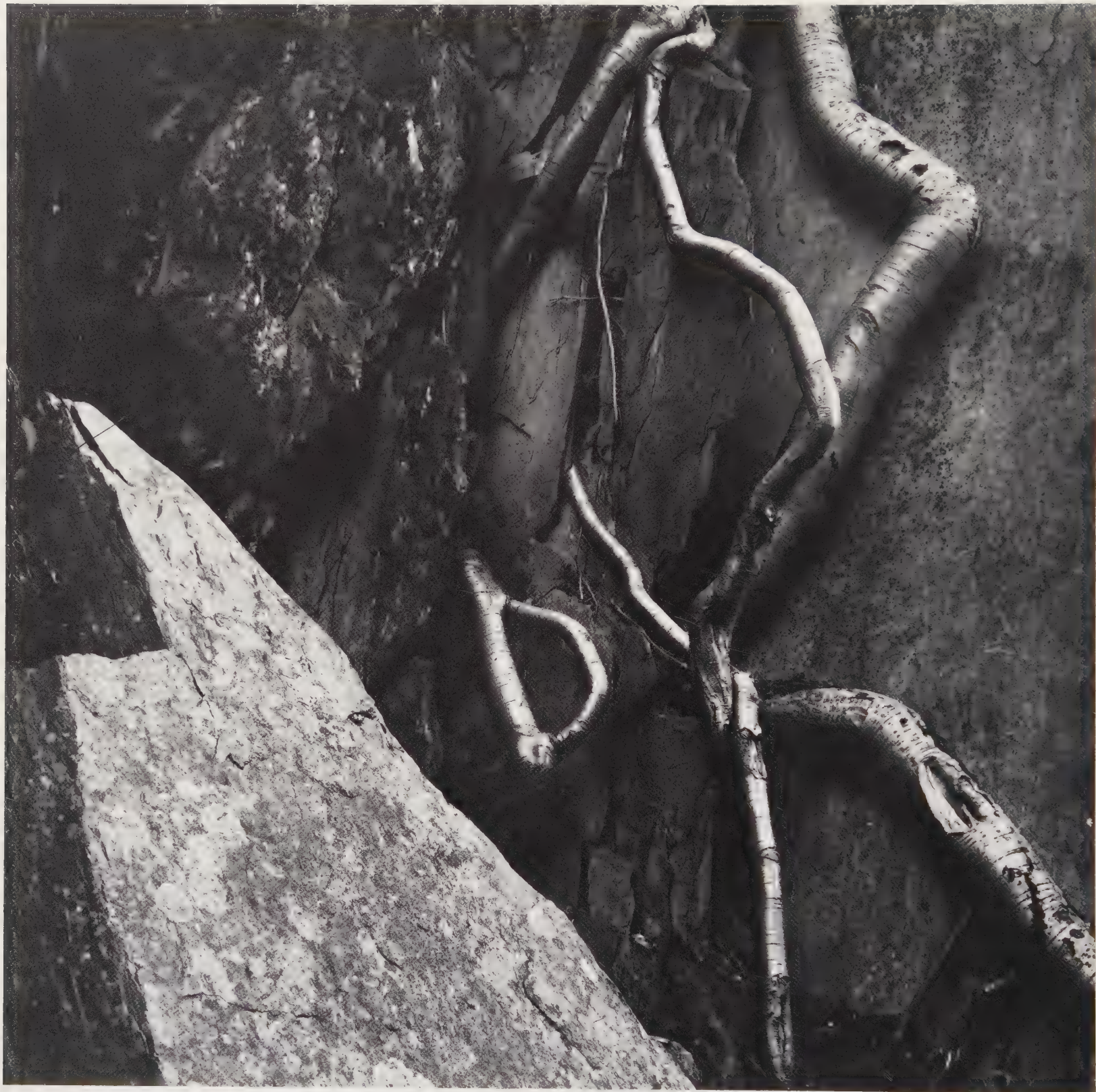
PETER MARLOW



AL CAMPBELL



HELEN SHIELD



HELEN SHIELD



HELEN SHIELD



RUTH MAYERSON GILBERT



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RUTH MAYERSON GILBERT



RUTH MAYERSON GILBERT



JOHN GOTO



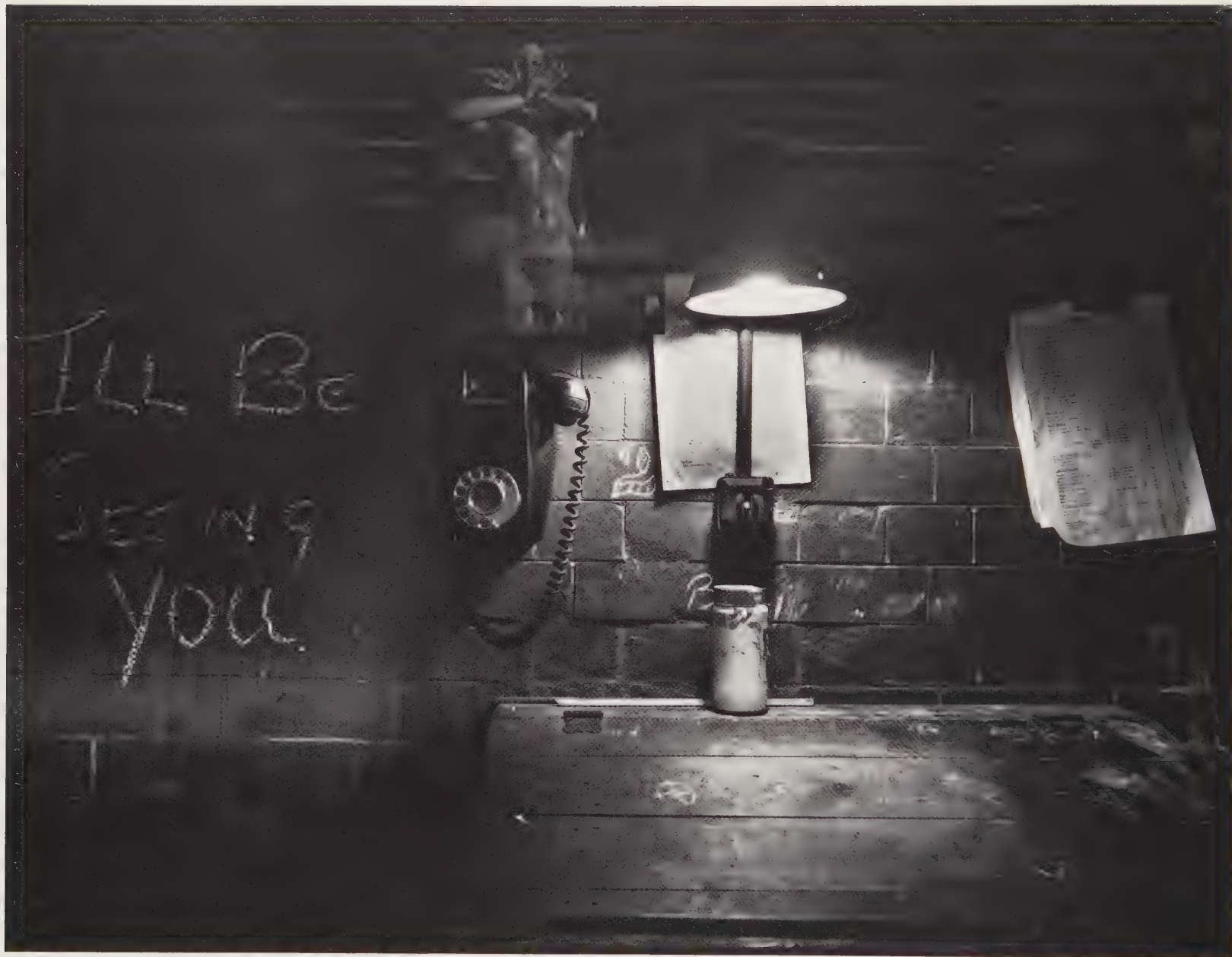
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JOHN GOTO



JOHN GOTO



IAN BEESLEY



IAN BEESLEY



IAN BEESLEY





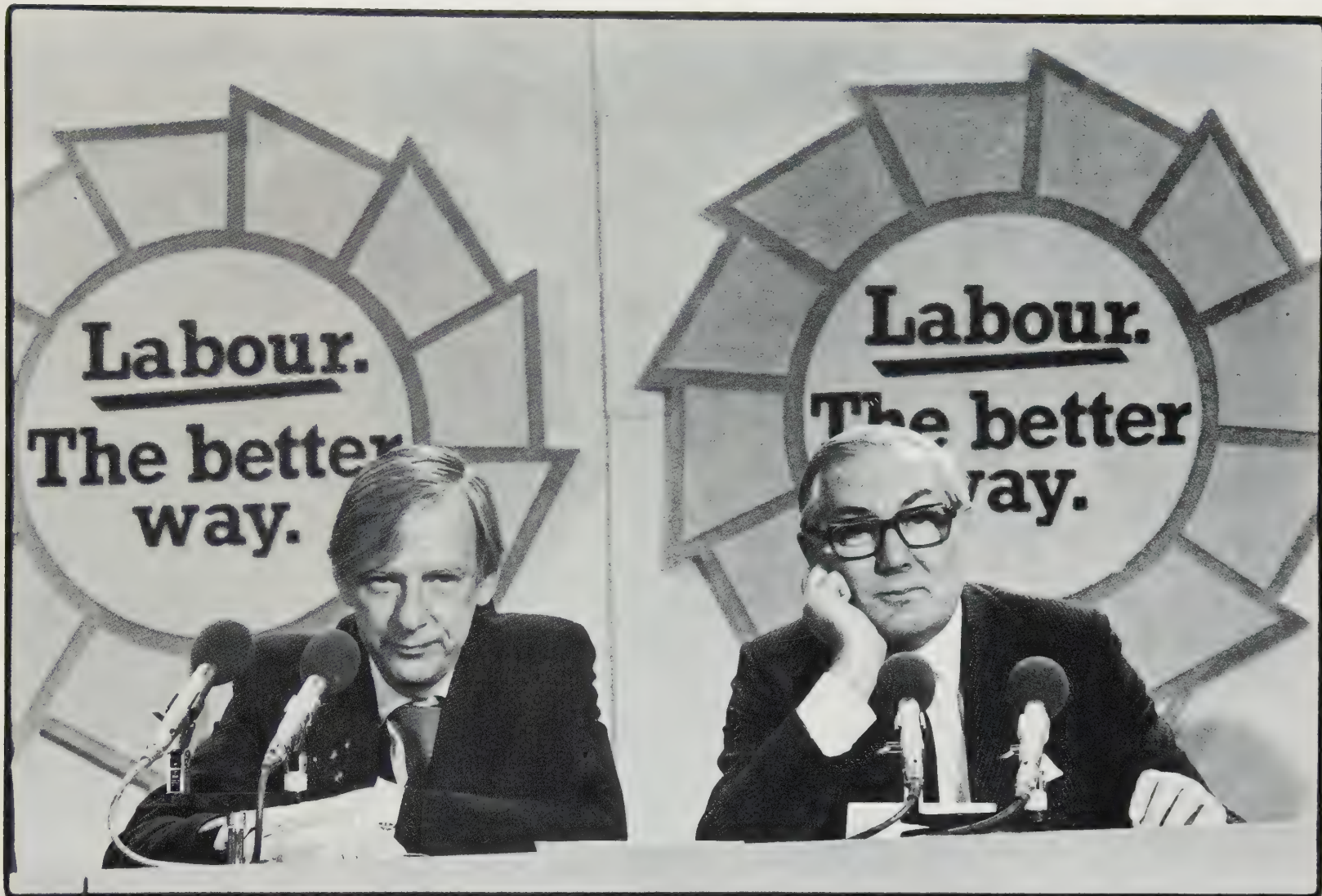
PHILIP HALE



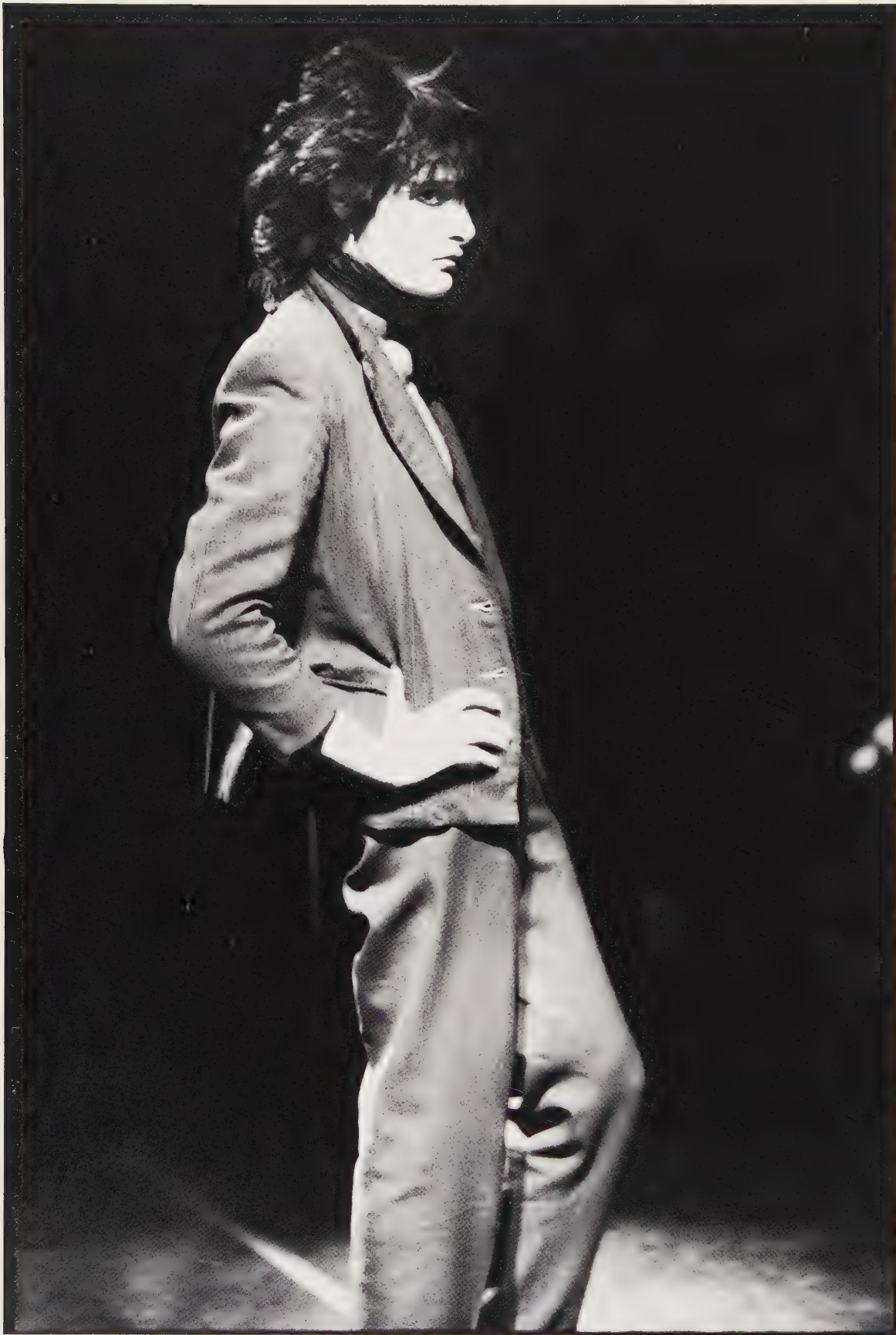
PHILIP HALE



PHILIPPE ACHACHE



PHILIPPE ACHACHE



JILL FURMANOVSKY



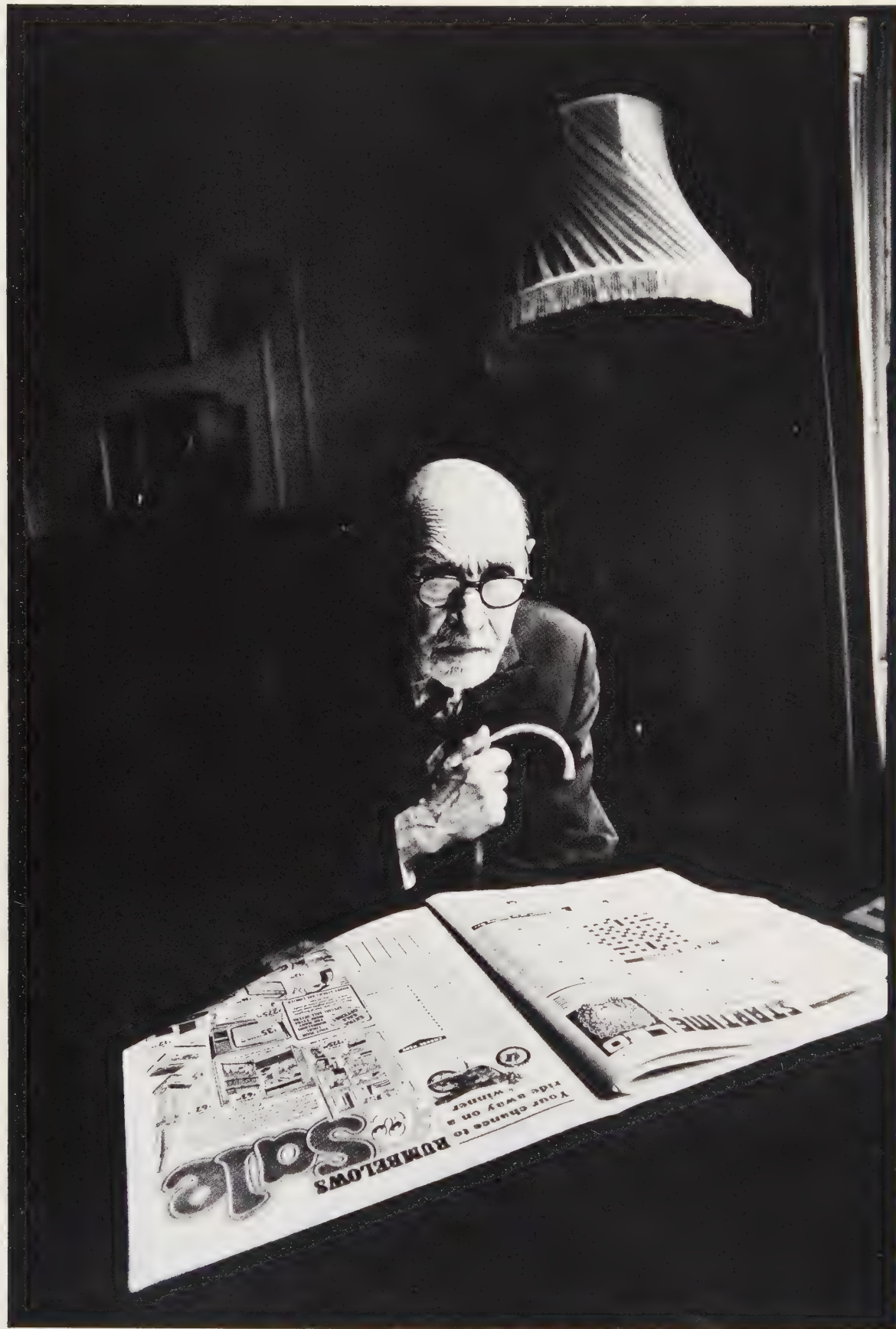
JILL FURMANOVSKY



JILL FURMANOVSKY



CHRISTINE LEAH HÖBBEHEYDAR



CHRISTINE LEAH HOBBEHEYDAR



CHRISTINE LEAH HOBBEHEYDAR



DENIS THORPE



DENIS THORPE



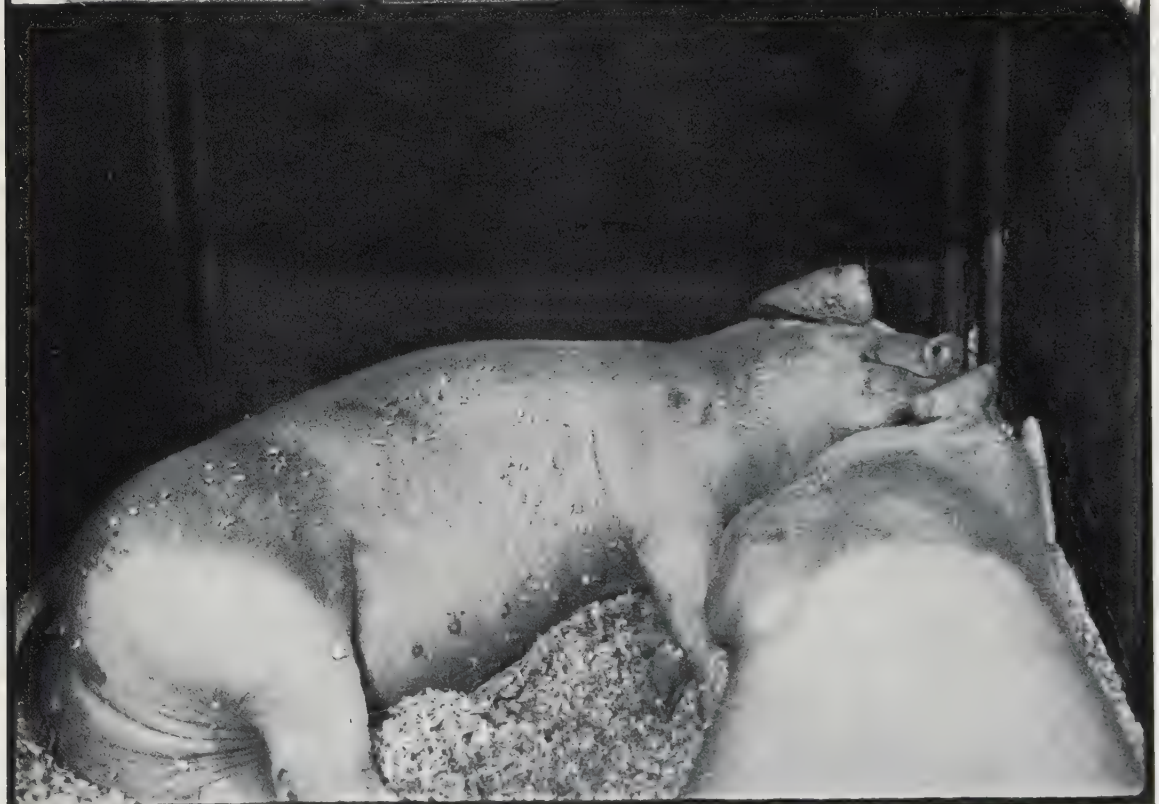
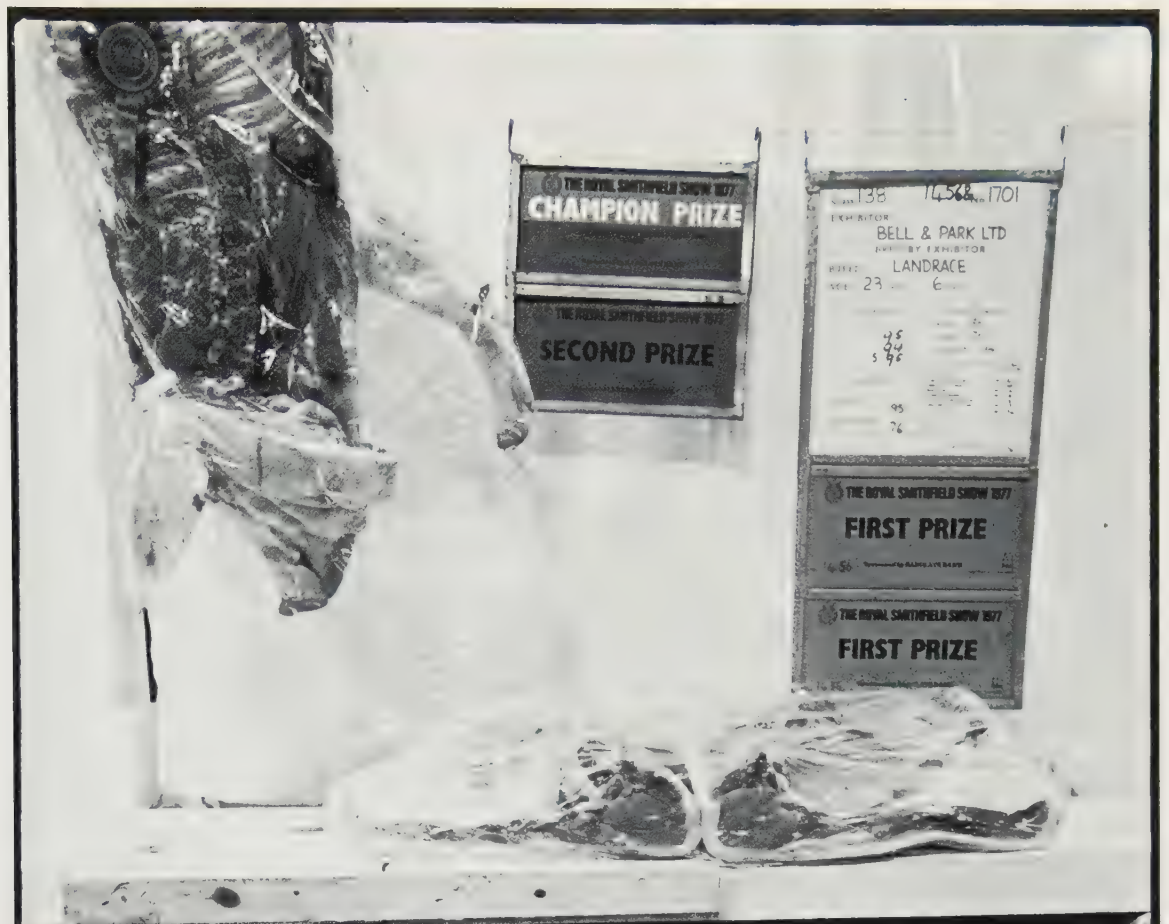
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DENIS THORPE



JIM BYRNE



JIM BYRNE



RON McCORMICK



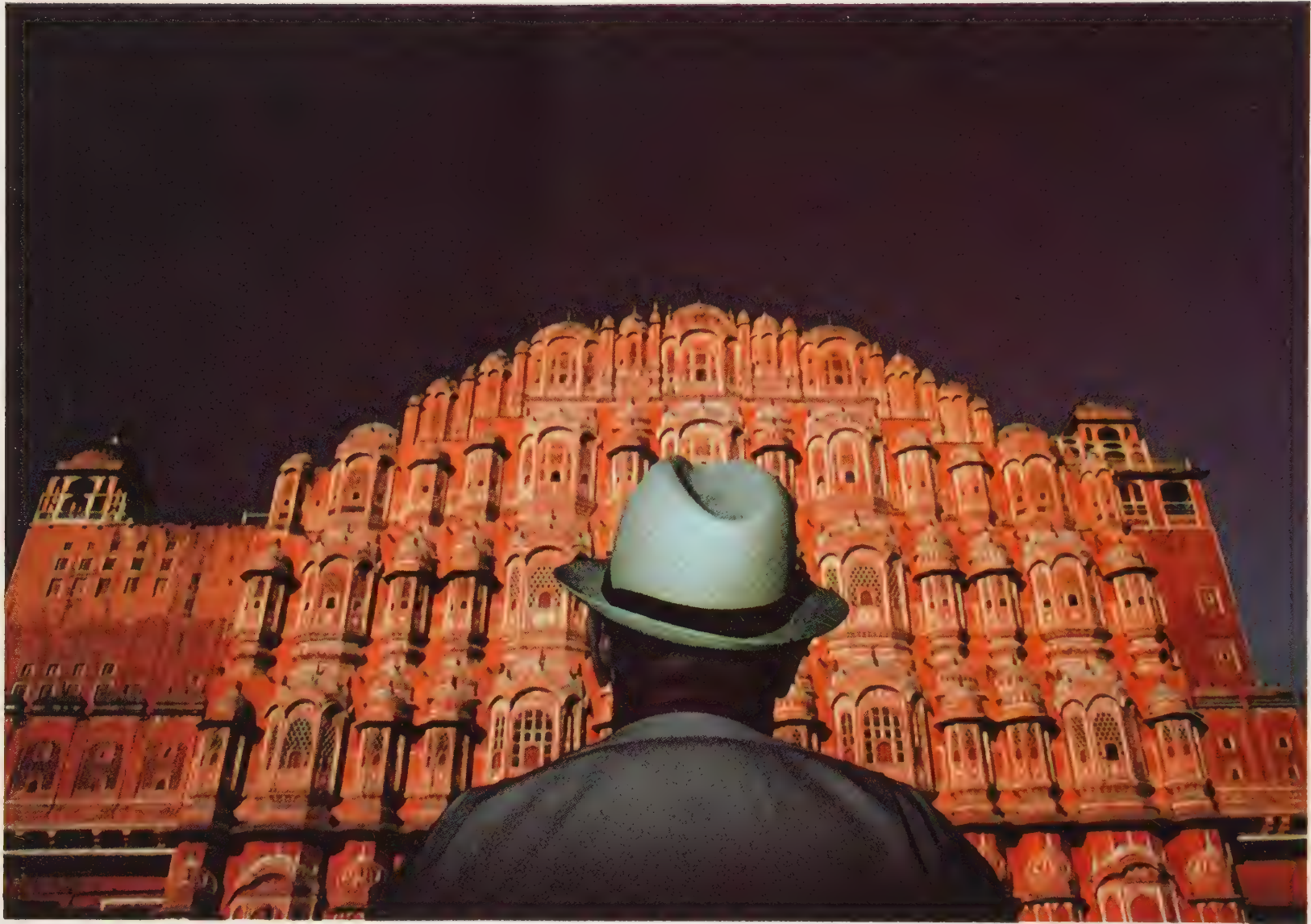
RON McCORMICK



RON McCORMICK



RON McCORMICK



CHRISTIAN VÖGT



CHRISTIAN VOGT



CHRIS BELL





PAUL WAKEFIELD



PAUL WAKEFIELD



DANA ROSS



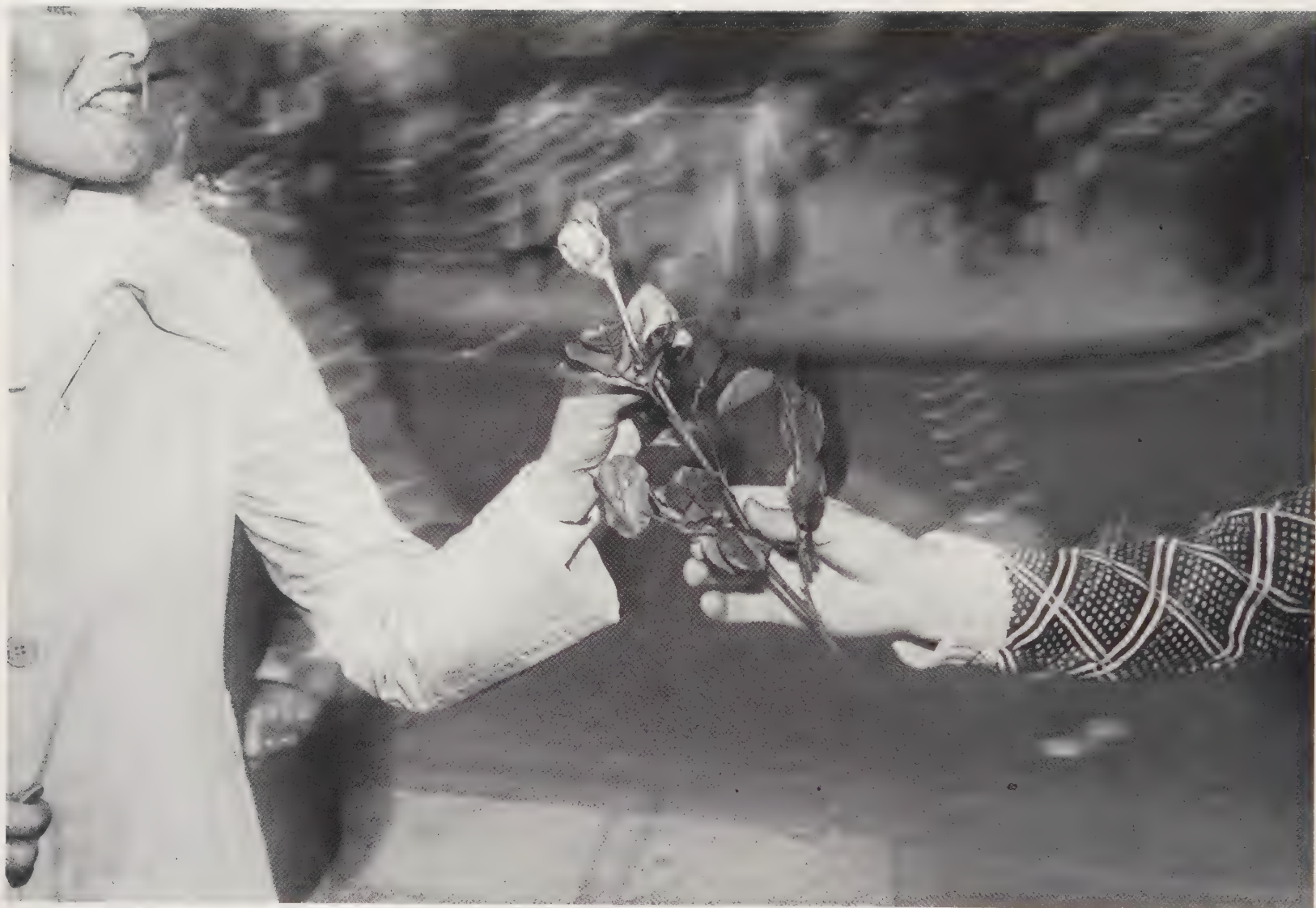
MICHEL HADDI



MICHEL HADDI



MICHEL HADDI



RICARDO GOMEZ PEREZ



RICARDO GOMEZ PEREZ



RICARDO GOMEZ PEREZ



RICARDO GOMEZ PEREZ





SALLY FEAR



RAGHU RAI



RAGHU RAI



RAGHU RAI



LINDA BENEDICT-JONES

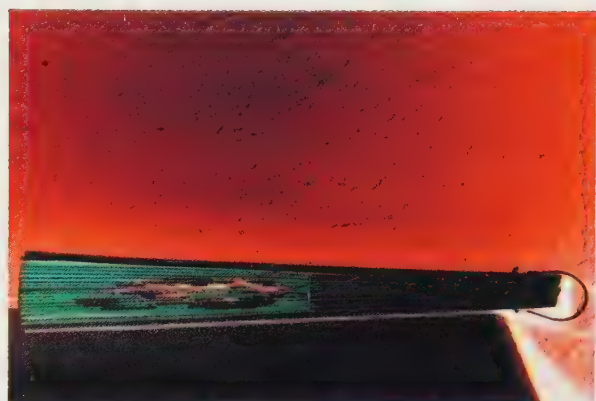
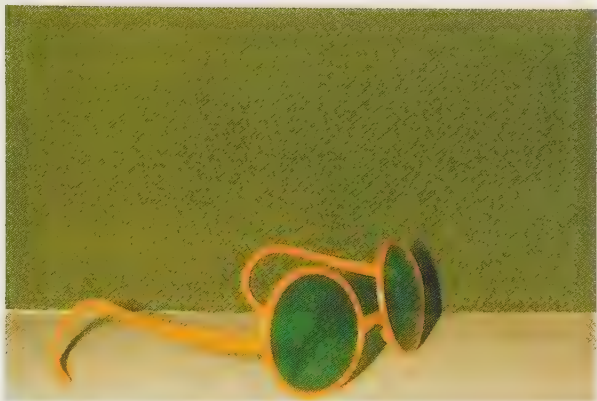


LINDA BENEDICT-JONES



LINDA BENEDICT-JONES





VERDI YAHOODA



PAUL GRAHAM



PAUL GRAHAM



PAUL GRAHAM



PAUL GRAHAM



SHARON KIVLAND



SHARON KIVLAND



SHARON KIVLAND



SHARON KIVLAND



MAUREEN O. PALEY



MAUREEN O. PALEY



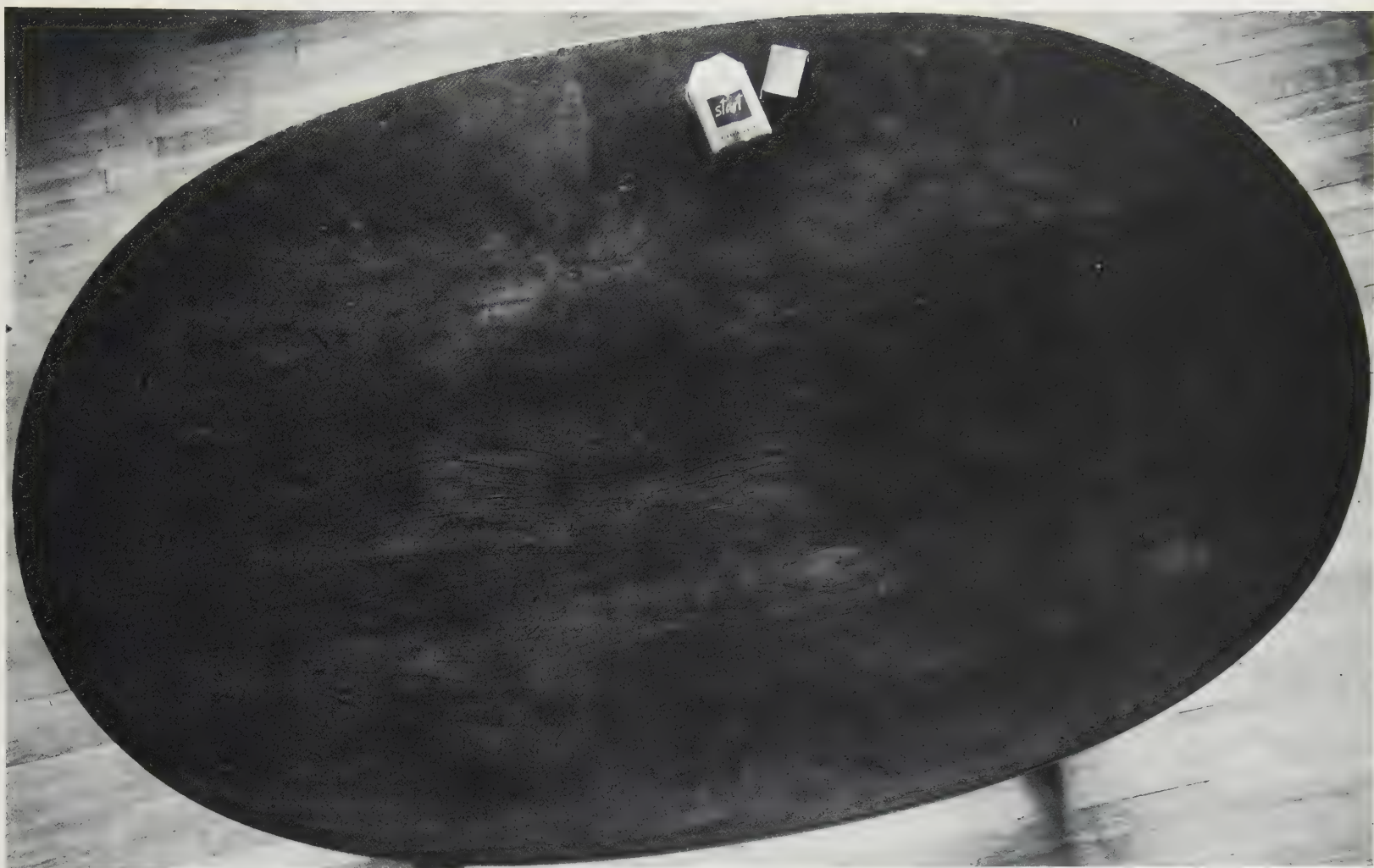
MAUREEN O PALEY



WILLIAM MESSER



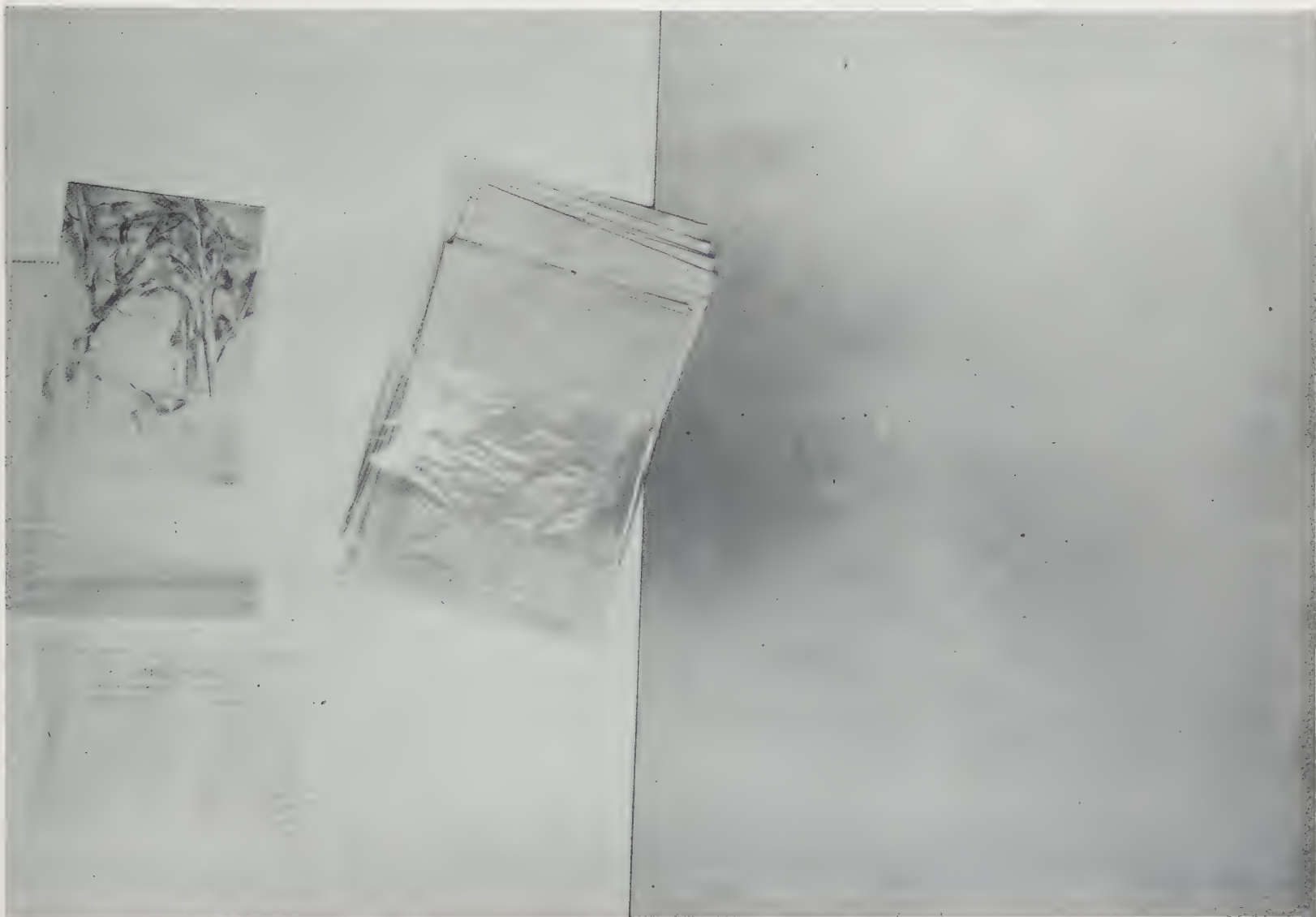
JAN SVOBODA



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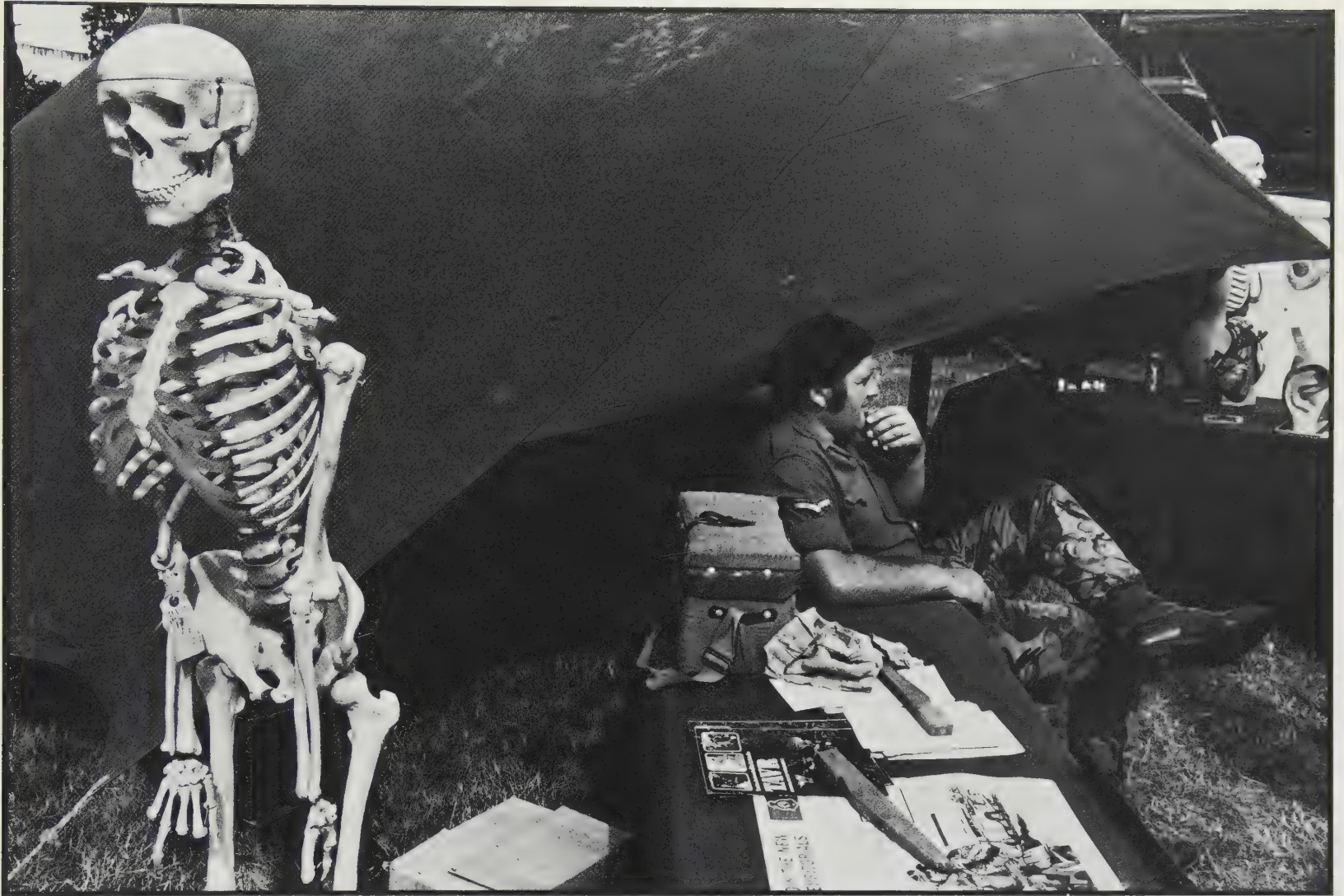
CONRAD HAFENRICHTER



CONRAD HAFENRICHTER



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CONRAD HAFENRICHTER



STUART FRANKLIN



STUART FRANKLIN



JOHN MALCOLM



JOHN MALCOLM



BO BOJESEN



BO BOJESEN



BO BOJESEN



BO BOJESEN



MARSHA POLIER



MARSHA POLIER



EDDIE POWELL



EDDIE POWELL

# THE PHOTOGRAPHERS

## PHILIPPE ACHACHE

Born in 1948 in Toulouse, France, he studied at the Polytechnic of Central London from 1970 to 1974. Beginning as an engineering student, he later turned to photography. After leaving the Poly, he joined Gamma, working for the first year in Paris and then from London after 1975. The photographs shown were taken during the 1979 General Election campaign. The first is the Thatcher family after the announcement of the Tory victory at Conservative Central Office and the second is at a Labour press conference in Transport House. **Pages 40–41.**

## IAN BEESLEY

Born in Bradford in 1954, he studied photography at the Bournemouth & Poole College of Art 1974–1977. He won a Kodak 1977–78 Bursary for Social Documentation. His three pictures which he titles ‘I’ll Be Seeing You’, ‘Fading Pin-ups’ and ‘Old Goat, Shoes and Hides’, formed part of an exhibition called ‘A Place of Work’ held last year at the Bradford Industrial Museum. **Pages 34–36.**

## CHRIS BELL

Born in 1946 in London, he first became a building surveyor and then an arts administrator. He studied photography at the Ealing Technical College and the Royal College of Art and is at present teaching part-time in colleges at Croydon and Oxford, as well as freelancing. **Pages 60–61.**

## BO BOJESEN

He works as a photojournalist, having been based in London for the last seven years. He distributes his material personally or through agents to magazines and newspapers in some fifteen countries. The photographs shown here were taken during the liberation fight against the Idi Amin régime in Uganda. **Pages 106–109.**

## JIM BYRNE

Aged 30, he was born in North Wales and now works as a freelance photographer. During the last three years he has been photographing in close association with Pete Addis to produce firstly the Afan Valley Community Show (1976) and ‘The Sheep Industry’ (1979). He aims to continue working on the theme of animals in our society. **Pages 52–53.**

## AL CAMPBELL

Asked to tell us about himself he gave the following list: ‘pinboy, stock-clerk, gravure printing, electro-plating, military, railways, college (English, chemistry, misc. science, semantics and philosophy), taxi-driver, photographic assistant, Photographer?? – Photographer? – Photographer.’ For the last three and a half years he has been concerned with photographing the landscape. **Page 20.**

## JAMES ELLIOTT

A young London based photographer specialising, commercially, in beauty and creative photography. He spends a great deal of time creating photographs purely out of dedication to the medium, ranging from the soft and beautiful to the grotesque and bizarre. The cover photograph is a typical example of his work. **Cover.**

## SALLY FEAR

Born in 1947, she worked for thirteen years in London and New York as a secretary. Her interest in photography began in 1974 and the next year she won the first Nikon Scholarship, which was to do a project on ‘Weekend London’; this was shown at the National Theatre in 1978. The photograph shown here was taken in Gerrard Street, London’s Chinatown, during the Chinese New Year celebrations. **Pages 72–73.**

## STUART FRANKLIN

Born in London in 1956, he studied commercial art for a short time before going to a kibbutz in Israel. He then moved on to Turkey and eastern Europe, coming back to Oxford, working on construction sites. Finally, after travelling round the world he went to Oxford Polytechnic and then to the West Surrey College of Art and Design. The photographs shown here were taken on a container ship during the round trip to the USA. **Pages 102–103.**

## JILL FURMANOVSKY

Born in Zimbabwe-Rhodesia, in 1954, she took a foundation course at the Harrow

School of Art before taking a Dip AD in Graphics at the Central School of Art and Design. In the last six years she has been taking photographs for the musical press. The photographs shown here are: Siouxsie Sioux rehearsing in Berlin, Debbie Harry of Blondie on their first British tour, and Kate Bush being interviewed at EMI when ‘Wuthering Heights’ was climbing the charts. **Pages 42–44.**

## RUTH MAYERSON GILBERT

Born in Philadelphia, the daughter of an artist, she is married to an economist and has three children. Her interest in photography began six years ago. Some of her work is in the French National Collection in Paris and she has had exhibitions in Basel, London, Amsterdam, San Diego, New York City and San Francisco. Her work has been published in *Zoom* and *Nikon Camera*. **Pages 24–29.**

## JOHN GOTO

Born in 1949, he studied painting at St Martin’s School of Art before working for six years in advertising and museum photography. In 1977 he was awarded a scholarship to Paris and in the next year one to Prague. He is at present lecturing at the Camberwell School of Art and the Oxford Polytechnic. The photographs shown here were taken in Prague, which he says is a beautiful and mysterious city, to whose Gothic and Kafkarian mood he responded. Most of the pictures were taken in an old, semi-derelict building. **Pages 30–33.**

## PAUL GRAHAM

Born in 1956, he was brought up in Harlow, Essex, before attending Bristol University where he studied science. Since then, he has been solely occupied with colour photography. In summer 1979 he had his first show at the Arnolfini Gallery in Bristol. Two books, *Interiors – Book of Original Photographs* and *Summer Autobiography*, part of a trilogy, were being personally published by him, containing original prints, in mid-1979. **Pages 82–85.**

## MICHEL HADDI

He was born in 1956 and studied electronics. He became assistant to an American painter in Paris, after which he worked in Saudi Arabia before moving to London, to open a studio. He is now working as a freelance photographer. **Pages 65–67.**

## CONRAD HAFENRICHTER

He was born in London in 1948 and lived in Brazil for five years before studying painting in London for four years. In 1969 he began research and a photographic project dealing with aspects of human and social behaviour. He is currently teaching photography at the Wimbledon School of Art and has exhibited widely in London. His photographs are in a number of permanent collections. **Pages 98–101.**

## PHILIP HALE

He was born in 1953 and brought up in Sussex. In 1973 he went to the Bournemouth College of Art for three years, after which he spent a year converting a village school into a studio. He then went to the Royal College of Art to work for an MA in photography. He works as a freelance from a studio in Plumpton. The picture of a man in a top hat was a cover for *Monacle* and the other, symbolising contemporary man trying to give up but with no-one to surrender to, uses a shot taken at Pompeii: both are air-brushed montages. **Pages 38–39.**

## CHRISTINE LEAH HOBBEHEYDAR

She was born in 1948 and came to London three years ago to study voice. Her interest in photography began two years ago and after experimenting with various aspects, she found her metier in social documentary photography. Her pictures were taken in London at Agnew House, a home for ageing Eastern European refugees from World War 2. Some are now in their eighties and nineties and have known no other home for the last thirty years. The residents range from counts, ballet dancers, doctors, scientists, to nannies, butlers and peasant farmers. Her work was exhibited in the Hayward Gallery exhibition *Three Perspectives – Recent British Photography* in 1979 and is included in the Arts Council collection. **Pages 45–47.**

## LINDA BENEDICT-JONES

One of the best known of contemporary photographers, she has had a very wide photographic education in the USA and Europe and also holds an honours degree in

science. Her work has been widely exhibited around the world and published in books and magazines. It is also in a number of permanent collections. Of the photographs shown here she says ‘Sometimes I allow myself to live in dreams. In these pictures, I have tried to record the reverie. Those captured moments can then be revived and experienced again in later, less consuming moments.’ **Pages 77–79.**

**SHARON KIVLAND**

She studied at the School of Art in Liverpool and the London College of Printing. Her work has been in a number of exhibitions in the UK including the Air Gallery and Anthony Stokes Gallery and some of her pictures are in the permanent collection of the Arts Council and the British Council. The pictures shown here were taken with an Instamatic and the original print size was 12 x 12in. **Pages 86–89.**

**BARRY LEWIS**

He was originally a science teacher: an amateur interest in photography led to study at the RCA, after which he became a professional photographer. The pictures shown here are part of a project for the Museum of London, ‘Coming and Going’, which depicts travelling in London. It was financed by the Arts Council and the exhibition is now a Half Moon Photography Gallery touring show. **Pages 12–16.**

**JOHN MALCOLM**

He was born in New Zealand in 1950 and came to London after leading an overland safari from Auckland. He studied photography at the Trent Polytechnic, Nottingham, and it was a Kodak Photographic Bursary in 1978 for his North Sea Oil Rig photographs which enabled him to produce his first one-man show. The photographs shown here were taken when he worked on an oil rig in the North Sea in various posts, to finance his study at Trent. **Pages 104–105.**

**PETER MARLOW**

Born in 1952, he has a degree in psychology from Manchester University. His professional photographic career started with the publication of a picture series on Haiti. He is London correspondent for Sygma, the Parisian photo agency, and also freelances for many of the world’s leading magazines. **Pages 17–19.**

**RON McCORMICK**

He was born in Liverpool in 1947 and studied fine art for four years in Liverpool and then painting for three years at the Royal Academy School. After this he worked as a freelance reportage photographer for various magazines and book publishers. From 1971–73, he was Director of the Half Moon Photography Gallery in London. His photographs have been widely published and exhibited; those shown here were produced whilst Artist-in-Residence at Gwent College. **Pages 55–57.**

**WILLIAM MESSER**

He was born in 1948 in Ohio and studied architecture and experimental media before concentrating on photography in which he gained bachelor and master degrees in fine arts at the San Francisco Art Institute. His work has been widely published in magazines and exhibited at leading museums and galleries. His writings about photography have been widely published in the USA and Britain. He is currently teaching in the London area. **Page 93.**

**MAUREEN O. PALEY**

She was born in 1953 in Brooklyn, New York, and was educated at Brown University. She has been making films and taking pictures since 1974. She lived in Stockholm for a year and made a number of films backed by Swedish TV, shown in 1977. She is at present a postgraduate photographic student at the RCA. The pictures shown were taken in London. **Pages 90–92.**

**RICARDO GOMEZ PEREZ**

He studied photography at the London College of Printing 1976–79 and his work has been exhibited in London, Barcelona and Zurich. It has also been published in a number of magazines, including *Zoom*. These four photographs shown were taken in London. **Pages 68–71.**

**MARSHA POLIER**

She was born in 1949 in North Carolina and studied at the university there. She then took a degree in fine art in communication arts and design. She has been involved in photography for the last eleven years and is now teaching it as a subject at the Virginia Museum. She freelances for various magazines and has received a number of awards. She prints on Kodalith paper with hand-applied colour to bring out the textures and patterns of choreographed movement. **Pages 110–111.**

**SANDY PORTER**

He studied at Bournemouth and Poole College of Art 1973–77 and then for two years at the Royal College of Art, and obtained a Masters Degree in Photography. He

has had work published in *Zoom* and contributed to group shows including ‘Nev. British Image’, Arts Council touring exhibition. He has exhibited work in America and Holland and shown work at the Photographers’ Gallery, London. He is now a visiting lecturer at Bournemouth College of Art, part-time, and works freelance for major publishers of books and magazines. He has work in the permanent collections of the Department of the Environment and the Arts Council. **Page 37.**

**EDDIE POWELL**

He was born in Ebbw Vale, South Wales, in 1952 and studied mechanical engineering at Cardiff University before taking a photography course at the West Surrey College of Art and Design. He is now working as a freelance photographer, his an exhibition entitled ‘Captivity’ was shown at the Photographers’ Gallery in London. The first of the photographs shown here, ‘Child/Tree Roots’, is one of a series entitled ‘Figure in Landscape’. The second, ‘Dinosaurs/Child’, is one of a personal series studying man/animal relationships. **Pages 112–113.**

**RAGHU RAI**

An Indian photographer born in 1942, he has been involved in photography since 1964. He was for ten years chief photographer of the leading Indian daily *The Statesman*. Since 1977 he has been a freelancer and represents Magnum in India. His pictures have appeared in leading newspapers and photographic books and he has produced three picture books and is now working on the fourth. Basically a photographic journalist, his more creative work has been undertaken during these assignments. **Pages 74–76.**

**DANA ROSS**

Born in 1956, he has had no formal photographic education but has been taking pictures since he was 15 years old. He earns his living as a fashion photographer and has been published extensively in Paris. He quotes as the major influences in his life Matisse, Van Morrison, Visconti and Henry Miller. The photograph shown was taken in Paris and is one of a set of fifty prints he hopes to exhibit. **Page 64.**

**HELEN SHIELD**

Studied creative photography at Trent Polytechnic and since graduation in 1978 is in receipt of a West Midlands Arts grant to photograph the large gardens and parklands of the area. Her work is being widely exhibited in Britain and is also in private collections in England and Europe. Her interest in the English landscape began in 1974 and her interest, she says, ‘lies with the forces moving behind the external manifestations and the natural world’. **Pages 21–23.**

**JAN SVOBODA**

In the absence of personal contact, John Goto has provided the following notes. Svoboda is probably the greatest photographer living and working at present in Czechoslovakia. Despite gaining recognition in his own country, his photography has unfortunately to date not been published or exhibited in the West. His direction is towards a metaphysical and purist approach, one in which some British photographers too are moving. His prints are large, often measuring 75 x 130cm, mounted on thick wood. He is now in his mid-40s; poor health and exhaustion have reduced his output in recent years. **Pages 10, 94–97.**

**DENIS THORPE**

A journalist since leaving school, he became ‘sidetracked into photography’. He went on to work for provincial newspapers before spending many years with the *Daily Mail*. His present job with *The Guardian* is the fulfilment of an ambition. His picture of the Queen at the opening of Liverpool Cathedral won a gold medal in World Press Photo 1979. **Pages 48–51.**

**CHRISTIAN VOGT**

He is one of Europe’s most admired and successful commercial photographers. The pictures shown are from his ‘Onlooker’ series on which he has been working since 1977. The pictures have been taken on trips to Canada, USA, India, France, Switzerland and Nepal. **Pages 58–59.**

**PAUL WAKEFIELD**

He was born in Hong Kong and works freelance producing pictures for record sleeves and magazines. He travels widely, taking landscapes for his own interest using a large format camera. **Pages 62–63.**

**VERDI YAHOODA**

She was born in 1952 and took a foundation course at East Ham Technical College, after which she studied fine art at Goldsmiths College, 1972–75, followed by a two-year postgraduate MA course in Photography at the RCA. The photographs shown are from ‘Mantelpiece with 36 Objects’, photographed in ‘The Green Room’, a collection of 1 to 36 objects starting with Joan Crawford, placed on the mantelpiece, in negative and positive and black and white. **Pages 80–81.**



*Moscow, 1974*

# BRIAN GRIFFIN

Clive Lancaster

The sheer ubiquity of the photographic image is something of a problem in its own right. Its vast quantities and the wide range of purposes they serve effectively prevent photography from being a clearly defined form. One can imagine arriving at some sort of definition, for instance, of the novel or jazz or poetry but nothing like this would be possible in photography. In this respect photography is like language or, to be more exact, it is like a language. This has nothing to do with what Susan Sontag said in *On Photography* when she remarked that photography was more like writing than it was like painting. In saying that photography is a language one means only that it is a means of communication; by means of it something can be said, or rather shown. Arguments therefore, if such still go on, as to whether photography is or is not an art or craft or whatever are entirely beside the point. Which is probably why they have never been resolved. It is a useful rule of thumb that when a question continually resists any satisfactory solution the fault may well lie in the question. In any case nothing useful would be accomplished were we to come to a solution. If we were to say that photography was or was not an art nothing would happen; the field would remain unchanged. But if we retain the conventional and thereby quite useful meaning of an artwork, then it is quite clear that photography is not art but that some photographs quite clearly are. By this I mean only that in a given instance the selection, organisation and control of the final image gives us, in a rather mysterious manner admittedly, that degree of information and pleasure we require of art. Quite where the boundary is between these two essential components is difficult to say, if not impossible. Whereas art always imparts information it is not the case that information always or even often constitutes art. 'Keep off the grass' or 'momentum is always conserved' are not examples of literature; not even of bad literature.

Even bearing this in mind one cannot make any definitive or predictive statement as to what is or is not art in some sense. Almost the whole effort of the modern period, as this is generally understood, tends towards this ambiguity. Not only in the world of art either; if we return for a moment to the earlier suggestion that photography constitutes a language, we may recall the linguist Chomsky's assertion that the totality of well-formed sentences in any natural language can never be known since new ones are not only always possible but certain. The rules governing the production of a successful photograph are really nothing more than the sense photographers have had as to what constitutes the essential structure of the images they are making. Photography, perhaps because of the rapidity of its growth and development and its democratic nature, has been mercifully free of elaborate aesthetics. To be abstract, to impart information and to give pleasure have always clearly been its inspiration. Lacking centuries of development and any close attachment to a privileged class or group its difficulty has always lain in its simplicity. 'The apparatus was used faithfully, Weston is reported to have said when pressed for those tedious technical details that so abundantly clutter the popular photographic press: details which, when one thinks about them (what lens, what film, what shutter speed, developer and so on and so forth) tend only to promote the exact copying of something that already exists. Since so little of consequence in photography depends upon technique, at least so I contend, and so much more upon how and what we see, the endless repetitions on technique in magazines and books are quite literally injunctions to copy. Sir Joshua Reynolds may have been justified in extolling imitation as the foundation of genius but he did not mean only imitation. Technical

competence is, of course, always necessary but is very far from being sufficient.

To say that a successful photograph is abstract, that it imparts information and that it gives pleasure is not, of course, to say a great deal. To begin with all photographs are abstract, that is to say they are abstractions; only our familiarity with them and the ease with which we 'read' them lends them an illusory realism. No negative or print coincides with reality, whatever that is; as Sontag has remarked somewhere photographs are less representations of reality than bits of reality in their own right. Giving information and pleasure is also rather problematic since all photographs give the first, to some extent, and any photograph may be said to give pleasure, if only to the photographer.

Perhaps the most obvious instance of this sort of thing at a fairly low level of energy and commitment are the literally countless photographs of pretty girls; these give a certain amount of information – what a pretty girl looks like more or less – and presumably some degree of pleasure, since there are so many of them about. But I shall argue later that we require more than these low levels of accomplishment; the simple information and pleasure we may, or may not, get from even a highly accomplished pin-up has little to do with the complex, ambiguous, deeply internalised ideas and experiences, that men have in respect of women. In this sense one of one's sharpest criticisms of 'glamour' photography is not that it is erotic but that that it is not.

An enormous amount of photography serves primarily to identify and advertise some commercial product; here again a certain level of information and pleasure is attained and, indeed, some advertising work is quite witty as well as ingenious. But like glamour work, with which indeed it is often inextricably connected to such an extent that one practically expects a free chorus girl with one's first Ferrari, advertising work seldom strikes deep although it may strike fast. The reason for this goes back to my earlier remarks about complexity. An ad, however witty or elegant, never puts up much resistance. It has to refer more or less blatantly to its product and that fatal reference invariably acts like a lightning conductor along which tension spills away. Without tension, without some sense of energy caught and held, a photograph will always fail, however elegant and ingenious. It seems to be the case that the photographer, governed by the nature of the machine and the emulsion, has as one of his or her principal choices to point the beast at the world they live in. That world is a complex and ambiguous phenomenon, to say the least. Therefore something of that must be brought to bear on our little image otherwise the earth becomes merely picturesque, the world of people and their lives and work become merely travelogues, and women – as I have already noted – become mere nudes. Of the other principal choice open to us, to create an entirely constructed world in a studio, I shall say nothing since it is the first choice, that of the realist tradition, in which I am presently interested.

And the realist I want to discuss here is the young English photographer, Brian Griffin, whose work is not only remarkable in its own right but raises a number of interesting points about serious contemporary British photography. I say serious only to indicate that although Griffin is perfectly professional there can be no doubt that photography for him is primarily an obsession and only secondarily a job. I say British because there is something subtly but clearly native about this particular product.

On the whole the past two or three years have gone well for Griffin; in the precarious way that is probably the lot of most ambitious photographers he



*Managing Director of Aerospace Company,  
1977  
Opposite page: Door into Lloyds, City of  
London, 1978*



has been successful. His portrait work over the past five or six years formed the basis of a successful exhibition at The Photographers' Gallery last year; some of his work was also shown at the Hayward Gallery in May. Many of the photographs in these exhibitions feature his remarkable portraits of businessmen, of captains and lieutenants of industry, bankers, trades unionists and industrialists. All of these portraits were originally commissioned by business magazines, who are to be congratulated on commissioning and using such original, subtle and even subversive images. One of the most remarkable things about Griffin's work in this field is the originality he has achieved in what might on the face of it have seemed a rather unpromising area of subject matter. In the normal run of things if one had been told that his exhibition consisted largely of pictures of businessmen and trades unionists one would hardly have thought this an outstandingly promising sign. In fact he has brought the thing off triumphantly. Another area in which Griffin likes to work is for musicians. He has worked for Elvis Costello, Lene Lovich, Devo, Graham Parker and the Rumour, Nick Lowe, the Pop Group, and others. As well as being photographically interesting work, this association with some of the more inventive and enterprising popular musicians around is part of something very influential in Griffin's work and thought. In his flat there are few photographs to be seen but many books and many gramophone records. He has also taken many photographs of buildings and, indeed, buildings feature prominently in his

portrait work.

Part of Griffin's highly charged and idiosyncratic view of modern Britain that emerges in his portraits derives from his own experience. Hearing someone innocently admiring the fact that a remarkable image could be accomplished in such a tiny quantum of time, he remarked that in fact it had taken thirty-one years and a sixtieth of a second.

He was born in the Midlands on the outskirts of Birmingham near countryside which has now vanished. He went to grammar school, was an enthusiastic amateur photographer, loved modern music like so many of his contemporaries, then left school and went to work. He worked as an estimating surveyor for a large company involved in the nuclear-power station business. That lasted only about three years but it seems to have cut deep and left an enduring mark on his work and his thinking. 'Going in and out of that huge building, day after day, seems now to have been a very strange experience,' he says, 'there seemed to me then, and still does, something wrong in all that. It had nothing to do with me as a person or, as far as I could tell, with anyone else' Much of what passes as work in our society seems to Griffin to be a strange habit remotely connected with a wage packet. The notion that much of commerce and industry is, from a personal point of view, an exercise for automatons is strong in his conversation and in his work. It is a clue to his strange, almost dreamlike and distinctly subversive images of the captains of industry in which they



appear more as victims than masters. It is also a clue to his liking for musicians whose precarious, often gypsy-like struggles to play their own music and pay the rent indicate to him at least the taste of personal authenticity. Society offers us a variety of respectable roles but many find them tasteless, something all our masters might do well to pay attention to. 'Nobody can do what they like altogether', he says, 'personally I prefer eggs to office buildings but the offices are here to stay. Even so there does seem to me to be something frightening about the real meaning of those figures filing silently through the office entrances'. Among other things, Brian Griffin is a photographer of alienation; he admits to no dogmatic or party oriented political views but like many before him he is at least an emotional marxist. In discussing the photograph of people filing into Lloyds, he remarked: 'I know they are individuals, real people, that they have a real existence to their friends and families, they have hobbies – I mean that one at the end perhaps plays squash and is a conservative – and all those things that make a real life. But even so – that building and what goes on in there over-rule all that for its own purposes.' Whatever a man's views of himself may be, Griffin is saying here, when he becomes producer or consumer in relation to many of the institutions of modern society then those views are negated, they no longer count. The damages that modern society inflicts are, of course, part of a respectable and enduring tradition in British photojournalism. For the most part, however, we have been content

to document the more obvious and dramatic aspects of this damage; the backyards of a declining industrial north, the poor, the unemployed, the glittering rows of slate roofs or the picturesque shambles of a Cockney slum. Griffin's subtler contribution to the photography of social reality has been to focus not on the servants and the victims but upon the ostensible masters, to show them as also victims of their own creations, to do it in a series of superb images and to get paid for his efforts. If nothing else one must say he is audacious

There is more than a nod in the direction of the surrealists; the man in his business suit gazing at a strange industrial landscape in Wandsworth – with what feelings we cannot say since he decently turns his back on us – is surely a descendant of those bowler-hatted protagonists of Magritte who drift serene and unconscious through so many dreaming suburbs, unregarded and unregarding.

Nevertheless, there is nothing simplistic in all this: there is nothing in Griffin's work of a juvenile howl of protest. The eggs already mentioned may represent one kind of reality and value but the office block, the fuel dump and the bland, glittering facades of the City also receive their due attention. 'The City of London has been a marvellous place for me', Griffin says, 'I love the monumental coldness of the new buildings, the scurry and bustle – all that business getting done. All those people, too. And then you get the extraordinary emptiness and silence at certain times, closing time so



*Untitled, Glasgow 1978*  
*Opposite page, Self portrait, 1977*



*Lene Lovich, 1979*

to say.' Those three years on the office conveyor belt come to seem almost indispensable in their influence on his work. In my conversations with him I had the impression that they remain in his mind as an enduring stimulus and one of the sources of the tension and ambiguity that characterise so much of his work.

Connected with this question of personal experience is the matter of influences. No doubt Griffin has been influenced by other photographers, not only by the almost unconscious selection and storage of the countless photographic images with which we are daily bombarded but by specific influences, 'masters', so to speak. But in conversation he rarely refers to other photographers and much prefers to talk of books, painters and music. This seems in harmony with his work and its distinctive quality which is that it is, at heart, about the world and not about photography. His technique emphasises this; while it is highly accomplished it doesn't call attention to itself by means of technical tricks of any kind; the tone is quiet, still, almost serene.

'What matters is the image itself. I think about this for a very long time and then I try to get it done as quickly and simply as possible. I use simple cameras, rarely use filters or lenses with extreme perspectives. I have to use lighting quite often because of the places I get into – offices, corridors, lifts, usually dim, badly lit places. But I prefer natural light and keep lighting to a minimum. In the portraits – the 'Portrait of our Time' series – I often had to work in a hurry.'

Although the work with musicians is done with different feelings and in different conditions something of the same quality of Griffin's other portrait work is clearly evident. Consider for example the portrait of Lene Lovich. Apart from any other qualities it may have it is an unconventional photograph of a girl pop singer. This is no dolly of the stereotyped sort, showing her legs and cooing Ooh Ah, but is obviously a woman of some character and determination, formidable rather than cuddly, and a woman of professional and personal respect. It is an authentic nod of recognition from one artist to another. It is often the case that someone with something to say prefers to go to school with others who have something to say, something different for preference, hence Griffin's inclination to talk of writers, musicians and painters rather than other photographers. On this question, incidentally, he is very reticent; efforts to draw him out achieved only the assertion that 'there's an awful lot of rubbish about and you can make a fortune if you can hustle and make the product look good', and an unsolicited aside that high street weddings-and-baby men are often very good workers who do a straight, honest job and are underrated.

The photograph of Lene Lovich is one of the most successful of his photographs of musicians in terms of the development of his style; it has the simultaneous qualities, which might seem contradictory, of stillness and tension which mark most of his work and which derive from his ambiguous yet coherent response to the world. To try continually to achieve a visual image which expresses this complex view of things and at the same time satisfy the demands of clients, who may have quite different requirements, is something of a tightrope act. Successful businessmen and unionists no doubt have their own views of the appropriate kinds of images with which to confront the world and the same is obviously true of the magnates who produce pop records. In one sense Griffin avoids some of the obvious problems that could arise by working for musicians he likes, which is perhaps not so in the case of the 'Portrait of our Time' series where the context, if not the personalities, are often temperamentally uncongenial to him. It seems to be necessary for him to work in situations which give rise either to technical or personal tension or even both. In the 'Portrait' series this comes from his feelings about the nature of commercial and industrial life, and in the case of the musicians it comes perhaps from the demands and conditions inherent in the production of a record aimed at a mass market, together with the attendant publicity stills and posters. Griffin seems to work best when there is present in the photographic encounter things that he both likes and dislikes, as though he deliberately sought out

the kind of work that provoked his taste for tension and ambiguity. This seems to me perfectly appropriate for a serious and thoughtful contemporary photographer.

Ambiguity and tension are often asserted to be characteristic features of modern urban life but it is the case that a deeply felt and hard-thought response to experience will always have these qualities. Perhaps in the early days of photography it was easier to respond to the unique and novel perspectives revealed by the camera, just as anyone who uses a camera will recall the first enchantment brought about by pointing the machine at the world and pressing the button. But in speaking of his decisions, first to leave the office behind him for ever, then to go to art college and then to become a professional photographer, Griffin makes it quite clear that all this, however imperfectly understood at the time, was done to learn about himself and the world he lived in and to make photographic images which created as exactly as possible a visual equivalent. It has been said that photography is a kind of appropriation of the world, a fixing and taking possession of it. There is something in this but in the act of appropriation and fixing, of taking possession, something is learned, one's understanding is altered and the world changes, so the process is unending. For a moment the businessmen who appear in so many of Griffin's portraits are caught and fixed in his vision; a meaning has been more or less successfully established but the men and their world remain free in the larger sense. The photographer packs up his gear and departs whilst they, no doubt, order lunch, drink coffee, carry on with the business of hiring and firing, buying and selling.

Griffin is clearly aware of this; his achievement lies in the deceptively simple way in which the best of his photographs clearly embody it. One of the points he emphasised in our conversations was that he wanted his photographs not to be too easily or too rapidly assimilated. 'A poem should almost successfully resist the intelligence', the American poet Wallace Stevens remarked somewhere and clearly this notion has its appeal to the photographer where too rapid a 'reading' of his work can consign it to anonymity before it has ever been clearly seen. It is not the only way of working, of course; there are many sorts of good photograph, some of which have not yet come into existence, and only an egomaniac would want to preempt the field in advance. No doubt a very simple and directly made image can have its charm and interest, although interestingly enough such photographs are often found to be rather old and anonymous. The passage of time confers upon an image its own complications and ambiguities. One can see this clearly in the widespread interest growing up around early work in photography. Images once quite overlooked are now discovered to have a strange but quite definite fascination. One might add here that, like the current passion for more and more recent bric a brac, what now constitutes an 'early' photograph is becoming perilously recent, a consequence perhaps of both mass production and consumption, and its attendant spirit of rapid change. There is a sense in which all photographers live in that world of Andy Warhol in which everyone will be famous for fifteen minutes.

Griffin's images are seldom simple, however; the best of them have a striking *simplicity* but this has been achieved by bringing together in a coherent whole a set of fragmented components which would otherwise have remained forever separate. Consider, for instance, the two photographs of the Empire State Building and of a man in a raincoat at Great Orme, Llandudno. Both of these have a deceptive simplicity, especially at a first, casual viewing but a longer look makes it quite clear, I think, that these are far from being immediately 'readable' images.

It may seem that I am suggesting that Griffin is an intellectual photographer; well, I believe he is and that ideas are not only an important part of his work but lie at its foundations. There is always a danger for a highly conceptual artist of becoming too explicit or obvious. The almost instantaneous way in which we read a photograph makes this a special danger and a great deal of recent work of the conceptual type falls into this



*Great Orme, Llandudno, 1978*

trap by making its point only too clear. Griffin himself very occasionally fails at this point although very rarely; in one photograph, not reproduced here, he includes in an otherwise very powerful portrait of a man, a small wooden marionette. The intention is clear but it doesn't work; the marionette has the fatal effect of draining away all the energy in the image. In general, though, he maintains a very high level and his use of objects, buildings, urban spaces and light as signifiers to illuminate his portraits is extremely finely judged. Consider for instance one of his most extraordinary images, the businessman standing in his office, holding a book and overlooking his factory buildings and car park. The resolution here of a large number of bits of information into a single, coherent and highly complex image is a tour de force, achieving clarity without being obvious, ambiguity with being obscure, and complication without being fussy or cluttered.

To achieve a style is never easy, especially for someone working in contemporary popular art. The continual pressure to be novel, to be striking, bizarre or eccentric in an immediately appealing way, is very great. Working entirely in the day-to-day realities of commercial photography, Griffin has managed to make and maintain a personal style at a very high level. In such circumstances the more leisurely world of teaching and of Arts Council grants has its appeal. 'I hardly ever touch a camera now except

when I am on an assignment. I rarely carry a camera unless I already know what I am going to do with it. It would be pleasant to just drift around for a while and do whatever caught my fancy. People keep saying this country has had it but in the arts something amazing is going on. We're having a renaissance. Just take music and photography – there's work being done in this country that beats anything. The Americans, for instance, are so good at getting things across, at the hard sell, that everyone thinks they're in a class of their own. But it's not so. I'd like to chronicle what's going on here now – in my own way, of course.'

It is interesting to note certain obvious omissions in Griffin's work up till now. No gritty studies of the workers, no children, animals, pretty girls or conventional landscapes. He has chosen over the past few years to exploit – apart from his work with musicians – a severely limited and largely urban visual vocabulary; men, places of work, the spaces between the men, the buildings and between each other. There is little that is accidental in these photographs. Griffin has considered his approach, what he rather interestingly calls his attack, very carefully indeed. Odd insertions of chance do occur, however. In a very interesting portrait of the unionist Clive Jenkins there is as an accidental suitcase which, dropped haphazardly into an otherwise severely arranged composition, successfully re-arranges a



*Empire State Building, New York, 1979*

conventional portrait into something odd and unexpected. It is interesting to observe that whereas the figures seldom dominate their surroundings in Griffin's portraits, the surroundings often dominate the figures. There is no escape for them from the context in which they live and work; so we find no head and shoulder portraits in Griffin's work and we may note, too, the entire absence of expression in the faces. Meaning is to be derived from our relations with the world; it does not lie in what we might like to assert for ourselves.

'It is very easy to take striking and saleable photographs', Griffin says, 'once you know how to use a camera and how to get the effects you want, it can get too easy.' So it's a simple thing to get into tricks, if you see what I mean, playing around in a rather uninvolved sort of way to produce something pretty or striking. But when I went into photography I wanted to say something. I wasn't very clear about it, perhaps, but I felt it very strongly. Not only that, but I wanted to get it right. It's one of the reasons I don't carry a camera around with me everywhere and snap away at everything. I quite envy someone who can do that – well, sometimes I do, anyway. I'm always nervous when I take on a new assignment. I'm afraid nothing will happen, that it doesn't mean anything to me, that I have no ideas or feelings about it one way or the other. Perhaps after the Hayward

Exhibition is over I'll take off for a while. I spent five days in New York recently and only took one photograph. I might like another go at that.'

Whatever Griffin does in the future it can be confidently awaited with interest. With his looming, expressionless figures, glittering, watchful buildings, his men of affairs in sober suits surrounded by glass and steel and seen by empty boardroom tables covered with blank sheets of paper, he has created a body of work that says something authentically felt and thought about the time we live in, as well as adding to the language of photography. Nobody has shown more clearly how meanings reside in the relations between things, and the coolness and restraint with which he has constructed his meanings is exemplary.

In the end, of course, one language fails another. I have said that photography is a language with a grammar, however elusive to definitions and a vocabulary, however extensive and unpredictable. As such it says things in its own way, and these ways, especially when they are embedded in a successful photographic image, cannot be more than approximately expressed in another language. 'If I could say it', as the saying goes, 'I wouldn't have to dance it.' So we must go and look – and hope that those who can make such images, and somehow pay the rent – are able to maintain these small, authentic miracles

# KARL SANDELS

Åke Sidwall and Leif Wigh

No characterisation of former photographer and editor Karl Sandels is complete without mention of his intellectual vitality and probably unsurpassed talent as a storyteller. His knowledge, gathered during a life lived intensely, spans many fields. He is something of a walking encyclopaedia of photography and possesses an ability to phrase things rapidly that is both entertaining and alarming.

We say he is the doyen of Swedish press and reportage photography - something that he smilingly dismisses. He feels instead that that epithet should be borne by a photographer such as Oscar Halldin, Axel Malmström, Gustav Rydén, or Victor Malmström.

Be that as it may where that topic is concerned, when it came to our

interview, Karl Sandels took charge and spoke with an impressive glibness

which bore the unmistakable stamp of Stockholm – of a life devoted to photography and photographers and to being where the action is.

As a businessman, he has operated Sandels Illustrationsbyrå (a picture agency). He has also served both as Secretary and President of The Swedish Photographers' Association

Countless are the articles that have come from his pen. He still appears in print in the magazine *Fotonyheter*, which he founded in 1961. His book, *Fotografens värld* (The Photographer's World), he wrote with a young generation in mind – wanting them to approach a tradition-saturated profession well prepared both technically and aesthetically

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*We know that you were born in Stockholm on 5 November 1906, that your father was photographer Knut Hjalmar Sandels, and that your mother's name was Eva. You have both photographic and artistic antecedents in your family, then?*

Yes, pretty clearly. My photographic background goes way back in time, to when my grandfather learned the profession in the early 1870s with Bernhard Hakelier's studio in Örebro, which was a very well known studio in its day. Afterwards, he had jobs and studios of his own in Vänersborg and Alingsås and then went to Gothenburg, where he opened a studio on Södra Hamngatan in 1881. He sold that studio in 1889 and moved from Sweden to Norway, where he took over a studio in Fredrikstad, which apparently did rather well.

My father grew up in Norway. He was confirmed in Norway, as was his brother, Gösta Sandels, the painter, who is my uncle. Afterwards, they went to Kristiania – present-day Oslo – where my grandfather had a studio for a time.

I can mention parenthetically that there was a fire there, and all that Gösta managed to save were his drawings. He wasn't more than 11 or 12 years old. After that, the family moved back to Sweden, to Stockholm, and opened a studio at 15 Fredsgatan, across the street from where Fritze's Bookstore used to be. They had their studio there from 1901 till 1907, when they moved to 4 Biblioteksgatan: the famous Sandels address. You see, when they arrived in Sweden in 1901, they were highly successful immediately, and one of the reasons for that was that in addition to the usual carte-de-visite photographs or the cabinet photographs they produced – people would order a dozen or so – they also provided an enlargement with each order, and that was something altogether new. Enlargements had been done before, but this arrangement proved so popular, both Dad and my aunt later told me, that they had to have someone stand there handing out numbered tickets so that people could be taken in proper turn. They would have hundreds of sittings on a Sunday, so it was a big item.

After that, as I said, they moved to 4 Biblioteksgatan, and that studio I remember very well because I used to play in every nook and cranny of the place. Those were the days when prints would be made on daylight paper, so up there under the roof all these copying frames would be laid out, and I remember how the print girls would go and check to see how far the prints had come. I remember that scene awfully well. When my grandfather died in 1919, my father opened a little studio out in Älvsjö. My grandfather had

been very successful, and I think it's safe to say that in most people's homes, there was at least one cabinet photograph or carte-de-visite photograph with Carl Sandels, 4 Biblioteksgatan printed on it. He was possibly the one photographer people went to the most.

I remember once while I was growing up when Dad came home and told us they'd procured arc lamps and that they were terribly difficult to photograph by. They allowed one to photograph after darkness fell, as it was phrased then. Otherwise, all you could use was daylight from the big skylight in the studio ceiling.

All these things pointed toward my becoming a photographer. But I wasn't to become one at all. I very much enjoyed Uncle Gösta and his paintings and all that. I couldn't draw, but while I was attending Södra Latin high school, I went to my home-room teacher, who also taught German, and requested permission to take extra drawing instruction. I also wanted permission to eat at a French kitchen on Hornsgatan, because we weren't allowed to 'go into pastry shops and billiard parlours and the like'. So I asked permission, and I must've made my request in German; that was customary, as I recall. Anyway, he replied, 'You are not to have any extra drawing lessons; you're to go home and learn German.' And ever since that day, I've hated that language, although I have had plenty of use for it in photography.

*Was it you or was it your parents who hadn't intended that you'd become a photographer?*

It was me. I had no interest in it, none whatsoever. I can't recall why, but what was the photographer's profession in those days? The usual portraits, that's what, and they weren't any too exciting. I started photographing when I was 12 or 13, using a terribly simple 9 × 12 camera with an f/11 lens. I went over to Gotland and attended the Gothenburg exhibition and a few things like that and took perfectly ordinary amateur pictures. But what brought me into the profession was sports. I loved athletics, and I ran and jumped and did all the stuff that young people do. I helped start a little club in Älvsjö. I took a few pictures, but it turned out to be impossible to take very good sports pictures with the camera I had. But then I got a Goerz camera, which had a 120mm f/6.8 lens. And I really loved it because it had a focal plane shutter, and you could shoot skiers and sprinters and anything with it.

It was a relay race out in Älvsjö that got me into the profession. I've found the programme for that relay event, which was in August 1924. Funnily



*Two sportsmen fifty-five years ago. Winners Nils Welin and Georg Johnsson after the Södermalin Bicycle Race 1925*

enough, it says on the cover, 'See Sandels's photo coverage at the award ceremony'. I'd forgotten all about that, and I didn't see it till the other day I'd photographed the winning team, and that Sunday evening, Dad told me somebody from Alvsjö AIK (a sport club) had phoned and said I should go into town to *Dagens Nyheter* the next day with a picture of the winning team. So I did, and I was received by Carl Jonasson, brother of 'Mr Jones' David Jonasson – who was the big sports editor (along with Glokar Well). He said, 'Thank you, and now you can bill *Dagens Nyheter* for six crowns.' Then came my question: 'Do you always pay that?' And that's how it all started, because six crowns was quite a lot of money when I was 17 and had no major income. That I liked taking pictures went without saying – but being able to make money at it! So I started out as a photographer right then and there. Now bear in mind that in the Stockholm of 1924, there were about 10 daily newspapers. That's a little different from today. And of those 10 daily papers, only three or four had staff photographers. There was Gustav Rydén on *Dagens Nyheter*, Kalle Ransell at *Svenska Dagbladet*, Gunnar Södergren with *Aftonbladet*, and I'm a little uncertain of the guy's name on *Stockholms-Tidningen*. But those were the only ones on staff. Otherwise, there were a few freelancers who covered various events photographed sports competitions and the like. But I started at a different end. Naturally, a lot of things were happening in the city, but since the papers printed relatively few pictures, there was a lot that passed pretty well unnoticed. The papers didn't take simpler stuff. When the old Korpen (Raven) Pharmacy on Stortorget moved and they took down the raven that had stood there for 300 years, I photographed that. Usually, I'd do all that in the mornings, before going to my job at the office. Afterwards, I'd go out to Alvsjö and develop and print what I'd taken – 9×12 contact prints. It



Speed Photo-montage for *Stockholms Dagblad's* Sunday supplement 4 May 1930

wasn't till a little later that I started making enlargements of some of my pictures. Then I'd either go in to the papers with my pictures that same evening for the next day – or I'd mail them in. They were something like today's *Stockholm Scene*-type pictures, you could say, and things really started rolling because I was shooting a lot of things that nobody had thought of shooting before. I didn't realise what I was doing was as new as it actually was

Afterwards, of course, there were lots of sports pictures. By 1925, I had already gone to Copenhagen and Oslo and covered international matches and such. Those pictures got me my job on *Stockholms Dagblad* in the autumn of 1926. You see, the old paper was going to be completely redesigned and become something like today's *Expressen* – though, naturally, of course, there was some difference, but still. So, for that paper – which Kreuger and, later, Wenner-Gren had money invested in – they started hand-picking journalists, and, for some reason, they hand-picked me, too. They'd noticed me at the paper, and I got a very good salary right from the beginning and fine fringe benefits, so I was off to a great start

*That meant you quit your office job?*

I'd quit my office job in 1925 and set up my own little darkroom in the Normalm Building down on Stureplan

*So, you got off to quite a thrilling and rapid start*

Yes, it went quickly. I was off to a really fine start, but that was naturally because I had a sense of what would interest the newspapers

*You weren't just photographically knowledgeable, then; you also had the ability to see ahead by giving your pictures a completely new character or by providing new pictures that reflected something new*

Well, I had a little background, I suppose. And by background, I don't just mean book learning: family and a great deal else can also be factors. What it takes to be a skilled photographer is a good general education. That's number one. And the second thing is the ability to learn. I received, as I said a good start – 500 crowns a month in 1926, which was a lot of money. I felt the whole world lay open to me

All of us on *Stockholms Dagblad* were young. I wasn't more than 19 when I started there. And Maud Adlerkreutz and Sixten Ahrenberg and many other young people were there, too. We had lots of fun and practically lived at the paper. I'd get there very early each morning, and I learned a tremendous amount. You see, the chief editor of *Stockholms Dagblad* – former crime reporter at *Dagens Nyheter*, Sture Appelberg, a wonderful journalist – would arrive at the paper at 9 in the morning, and that's when I'd get there, too. I could tell by the smell of his cigar smoke that he was there, and I'd go to him for one hour each morning while he went through what the other papers had done with various things. It didn't have anything to do with photography, but that's where I learned a lot about journalism. I've always enjoyed journalism generally; so, in a way, I was sorry to come away from it when I went into Association work

*But you resumed it later, didn't you?*

Yes, although on an entirely different level. But we always try in putting together our newsletter, *Fotonyheterna*, to edit it as though it were a daily newspaper. Of course, it only comes out 10 times a year. But I mean its layout, and, of course, that's why it has its own profile. It differs from all the photo magazines.

But getting back to *Stockholms Dagblad*. There, I eventually got a pretty good darkroom, and right next-door, I had Georg Lagerstedt, the illustrator. It was quite a world of adventure! Philip Gibbs had written a book on his career as a newspaperman, which I had read. It was a fascinating world – and yet, when I look back on it now, it was so incredibly primitive. It was an adventure just getting sent to Gothenburg. Otherwise, you merely stayed in your own little city.

I was interested in technical things, and I experimented all the time with developers and negatives. Because negatives were so slow. We used a plate called the Hauff Ultrarapid with a rating of about ASA 25 to 30. It wasn't much to run out into the dark with. There weren't any electronic flash units. Even the vacuum flash hadn't been invented yet. On the other hand, there was flash powder, which could send you to the hospital – as it did me, for one.

#### *You burned yourself?*

I burned myself. Kalle Ransell and I were down at the Stockholm Central Railway Station to photograph some guys arriving by train. We set off a flash – I think it was Ransell who was holding the flash, so I must've been the one holding the jar. Well, the lid of the jar fell off and there was a powerful explosion. We both ran over to Serafimer Hospital to get patched up – and thanked God that our eyes hadn't been injured. I didn't get the last of the glass fragments out of my face until well into the 1950s. Flash powder was horrible stuff.

I was English-oriented. You see, as early as 1925–26, I had already begun to subscribe to *The British Journal of Photography*, which, in those days, never even contained one picture. But it was instructive reading. I used English cassettes and English plates. And there was nothing wrong with that, as far as that went. Hugo Svensson was publishing a magazine called *Kamerabiliden*. In 1929, it carried a little article about someone who had developed a plate and produced a print in 8 minutes, which was a record. I wrote to them and told them that the elapsed time from when I immersed a plate in my developer till I had a dry picture was 4 minutes 12 seconds. In those days, your thermometer was your finger. I guess an awful lot of the profession generally was in our fingers. There were no rangefinders on cameras. If you didn't have time to use the ground glass, you had to estimate your distance, and you had your camera set for a standard distance. When I'd photograph a sprinter, I'd shoot him at 7m. I'd mastered that. Otherwise, you had to focus on the ground glass, take it out, close the shutter, insert a double cassette, extract the cassette cover and hope your subject was still there. That's how things were done, and it wasn't regarded as remarkable at all!

I enjoyed the overall technical aspects a lot, and, of course, it was essential to exploit them to their limits. We created a sensation when we procured a camera with a fast lens. It was similar to Salomon's. But Salomon's was an Ernemann 4,5 × 6cm camera, and ours was made by Carl Bentzin. It was a 6 × 9cm camera with a f/1.5 lens having a focal length of 90mm. We dubbed it the *Cyclops*, and with it we used Ilford Soft Gradation plates, which were exposed under electric lighting, and we got pictures that weren't ordinary. You could take an action picture at Cirkus when Harry Persson was boxing – exposure maybe 1/20th of a second. Before, you couldn't have photographed that sort of thing at all – that was the difference!

I devoted an awful lot of interest to that camera, because it was a little special. You could shoot by available light with it, and that gave a little atmosphere to everything. In the late '20s, Zeiss came out with a new lens having a maximum aperture of f/2.7 and a focal length of 165mm. That's a pretty long focal length. It was used with the 9 × 12 camera and when I photographed people being interviewed at the Grand Hotel and other places. Instead of using flash or moving the person out onto a balcony or into the street, I took portraits by the light there was in the room. I did that quite a lot, and it produced pictures that were different. I'd use floor lamps then; I didn't have any lighting set-ups of my own with me; instead, I'd use what light there was. I wanted to get a little more atmosphere in it all.

#### *So you worked in parallel with Erich Salomon?*

Yes, you could say that. But what mainly inspired me to do that was an English magazine called *Graphic* – in the style of *The Illustrated London News*. They had a photographer who would photograph at banquets and

such, just like Salomon. I was perhaps most captivated by the English pictures. We got our *Cyclops* around 1930. There was no *Life* magazine in those days. The publications we pounced on then were *The Daily Mirror* and the German *Berliner Illustrierte*. They were fascinating. All the new stuff was appearing in them. I was terribly charmed by English reportage pictures. I don't know why, but I suppose the English fog created a slightly special atmosphere. Then, too, we have to remember that the literature one read – and still reads – was often English.

I had a right that not many press photographers have had: I was allowed to sell my pictures to magazines and abroad. That meant a great deal to a young man who would eventually be getting married. *The Daily Mirror* photographer in Sweden, that was me.

There I'd sit as a young photographer browsing through *Svensk Fotografisk Tidskrift*, and I'd go to a photo exhibition and think to myself, 'I'll probably never be able to learn to do that'. I read *Das Deutsche Lichtbild* from the start and thought it was fantastic. I didn't realise at the time that I myself was a cog in the machinery of development.

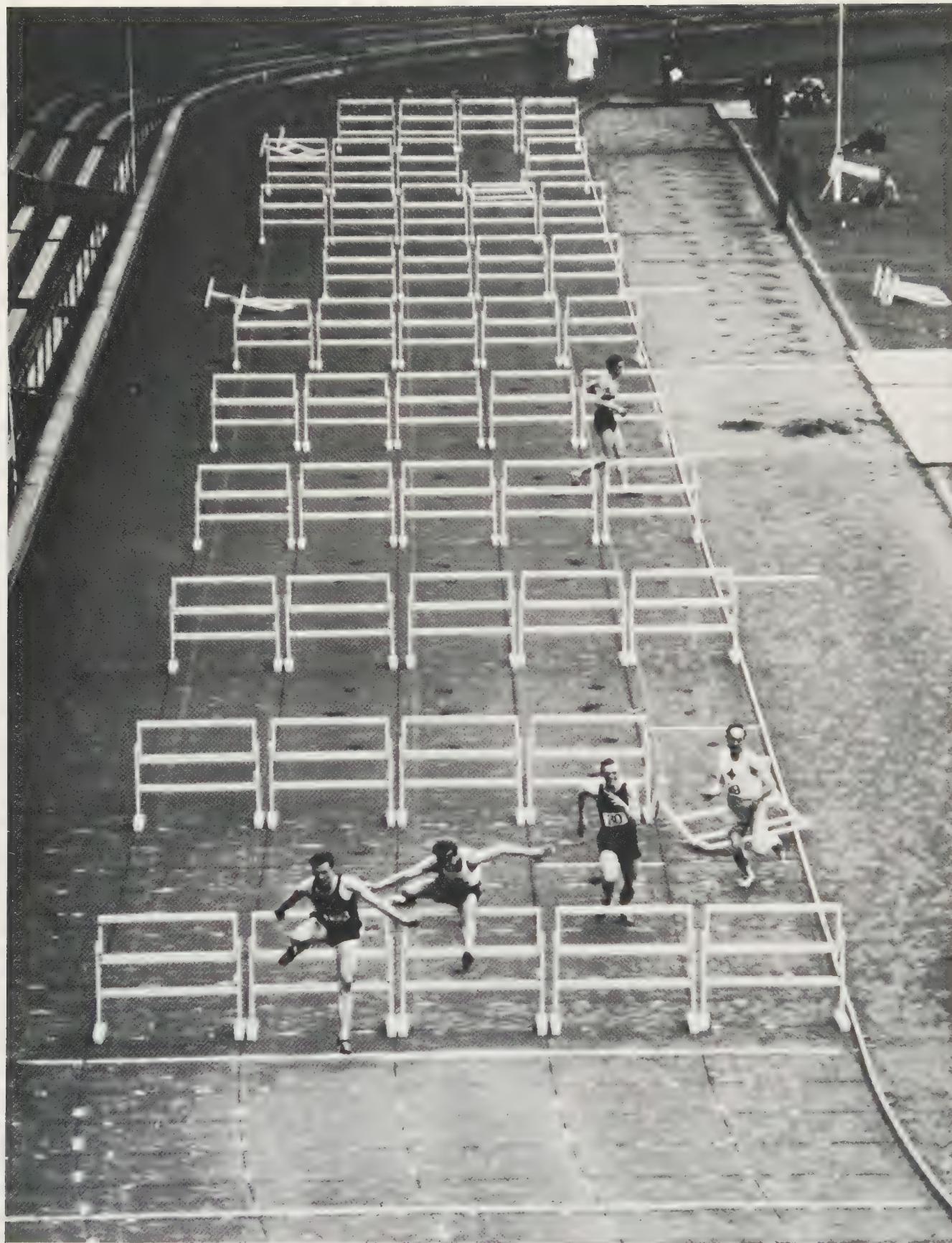
#### *Photographing by available light – didn't you have any problems getting your pictures reproduced in the paper?*

No, I didn't, but I suppose that was very largely because of the collaboration that went on at the paper. I belonged to the editorial staff in a way that I don't think has become common until now. Photographers have had to fight a long battle, and I feel they've fought rather poorly, that they've been altogether too compliant. We founded The Press Photographers' Association in 1930, and that was one phase of the evolutionary process. Actually, I've castigated photographers all my life because I feel they've far too often lacked fighting spirit when it comes to looking after their own interests. That's how I got into Association work.

Another thing I can tell you about, which was also part of those times, was something I'll never forget. That was when the vacuum flash came out and we received a couple to test. All exposure was by time. With flash, the procedure was that you had a cap on your lens, you focused, and then you lifted the cap. I'll never forget when I lifted the cap and fired the flash and saw it'd produced lots of light and dashed into the darkroom and developed the film and there was a picture. After that, progress raced along, and I was in on that, too. In America, they were taking an awful lot of synchronised pictures, and they'd been doing so even in powder days. They didn't have cameras like ours. Instead, when they'd photograph with flash, they'd use an ordinary 9 × 12 Ica camera with a Compur shutter, because it wasn't possible to achieve synchronisation with a focal-plane shutter.

We started synchronizing flash and camera at *Stockholms-Tidningen* when we went over to that paper in 1932. We built our own synchronisation apparatus. We made a connector rod out of paper clips. We attached it to the reflector, which was a scoop I'd bought at a variety store. It created quite a sensation the first days, when we could stand there hand-holding the camera. When the shutter was wide open, the flash went off – and the other photographers went out of their minds! Within just a couple of days, all the press photographers started arriving with the most amazing contraptions. There was an instrument maker on Mäster Samuelsgatan, Axel Sjölander, and the photographers practically took up residence there with their cameras, having him repair and arrange everything. And it was realised fairly quickly that to have any synchronisation, you had to have a leaf-shutter.

It became rather troublesome having two shutters. But that problem resolved itself when the Rolleiflex came into more general use. Axel Sjölander then made a synchronisation apparatus called the Gidi. From America, we'd bought both Kalarts and Mendelsohns, as well as a lot of other synchronisation devices. But then came Sjölander's, and most of us then used his. It was kind of fun having new things coming along all the time. Naturally, synchronisation had a fairly decisive effect on reportage photography in particular. I won't dwell on technical matters too much, but



110-meter hurdles, in the  
Olympic Stadium,  
Stockholm, 1931

in 1932 *The Times* published in one of its Sunday editions – those were the only editions there were pictures in – two large pictures they'd taken over the English Channel on infra-red plates using a long-focal-length lens. They gave me no rest. I photographed Omberg from over Lake Vättern, and we took pictures from Bredablick at Skansen Open-air Museum. And that was a bit new. We had a lens with a focal length of 1,000mm or thereabouts and had a hell of a time because of the focus differential with the IR film. Modern lenses have an IR scale. But we had no such thing, so it had to be calculated.

*We have a note here on our list of questions to ask you whether the IR photography you did in 1932 was on assignment for Professor Helmer Bäckström. The pictures were included in the exhibit The New Eye in 1939.*

No, it was Associate Professor John Hertzberg of The Royal Institute of Technology who took quite a few experimental pictures himself when Ilford came out with its IR plates.

*You come, after all, from a family of studio photographers, and yet you went into something quite different. Did you feel any boundary line between studio photography and the kind of photography you ended up doing?*

Oh, yes – there was a tremendous difference. Press photographers like Victor Malmström and Gustav Rydén never really received the recognition they deserved. They were the ones I looked up to. They were my masters. Because Gustav Rydén and Victor Malmström – I believe Victor Malmström came to *Dagens Nyheter* in 1927; he was on the staff there a couple of times – they were journalists; they knew why a particular person would be being photographed; they knew more than just how to snap a picture. There was a gap between studio photographers and press photographers. In the field of portrait photography, there were two kinds of photographer. There was the portrait photographer, and there was the outdoor photographer. It was the assistant who would be sent out to photograph a building, who had to do a job out on the street, or who would be sent off to take a group photo. The master wouldn't lower himself to do such things. There was something slightly ridiculous about the photographers at Gillet. They disappeared eventually, but just imagine! Pictures would be taken at every single dinner, and there was a bit of an aura of cheap festivity about the whole thing. And even though I didn't take part myself, I did sometimes feel a little sorry for the photographers one often saw working those events, who then had to dash home and develop their films. After that, a girl would go around selling the pictures. You see, Court Photographers like Sylwander, Flodin, and many others were real personalities. That thing about the title Court Photographer was a part of the times, so to speak.

Anyway, it was in 1934 that I became a member of The Swedish Photographers' Association, and I think Benno Movin became a member that same year. The first time Benno and I met was at a meeting at Gillet. I liked Benno a lot. He was a fascinating person. We sat next to each other, and facing the other way were Florman and Flodin and other Court Photographers. It made you feel like a sparrow amid dancing cranes. A letter was read aloud from a photographer on Gotland, who was getting competition from Polyphoto. He was asking the Swedish Photographers' Association to do something about it. Preferably, of course, to murder the Polyphoto photographer or something like that. At that point, I stood up. It was the first time I'd ever said anything before The Swedish Photographers' Association, and I said the following: 'Isn't it just possible that those Polyphoto pictures are better than the ones the other photographer's taking?' It was like pulling on a string. All these guys turned around and looked at me. Who was this who dared to utter such blasphemy? That was what started me toward my job in The Swedish Photographers' Association.

Remember the guild system, which disappeared in 1866. Craftsmen have always erected walls to protect themselves. They'd done so for a long time in Norway, and I said so, too. 'They're so proud of their craft guilds in

Norway. But as good as that wall may be, just remember one thing: it blocks your view out, too.'

I wasn't the first one to shock those old photographers. Before me were Herman Bergne and Arne Wahlberg, who'd come in in the late 1920s. In those days, advertising photographers and press photographers weren't regarded as real photographers. Press photographers in particular were looked upon as a lower caste. As more and more people started going into photography, I suppose it was only natural that a few press photographers would come along who weren't too fit for polite company. After all, it's like that in every profession. Things changed eventually, of course, as the mass media developed. And now, well, the height of achievement is looking unkempt and being employed by TV!

Generally, it was a period of considerable upheaval, and it was the end of the so-called artist period that had featured such photographers as Goodwin, for example. Afterwards came the '30s, with men like Edvard Welinder and Jan de Meyre. The Polyfoto made portrait photographers reconsider their approach and work in an entirely different manner. The result was that the old type of portrait photographer ceased to exist in the end.

Nowadays, people everywhere are taking colour photographs and sending them in to labs for processing. And, admittedly, the results are clear and sharp and nice, but the photographer has no technical control, so it's a little hard for me to accept that procedure.

It was a time of upheaval, as I said, and the advertising photographers and press photographers were beginning to attract greater interest than their portrait-photographer colleagues, who were also going through bad times.

*Can we say, then, that all this took place fairly exactly around 1930? That the end of the artist period and the upheaval leading to the new photography occurred around 1930?*

What did occur was that the Leica camera came out in the mid-1920s and made it possible to photograph in a different way. One no longer had to use the big Nettel cameras. When I started, I remember that sports photographer Th. Modin was using a 13 x 18cm Nettel. What happened was that photographing became easier; it became more commonplace.

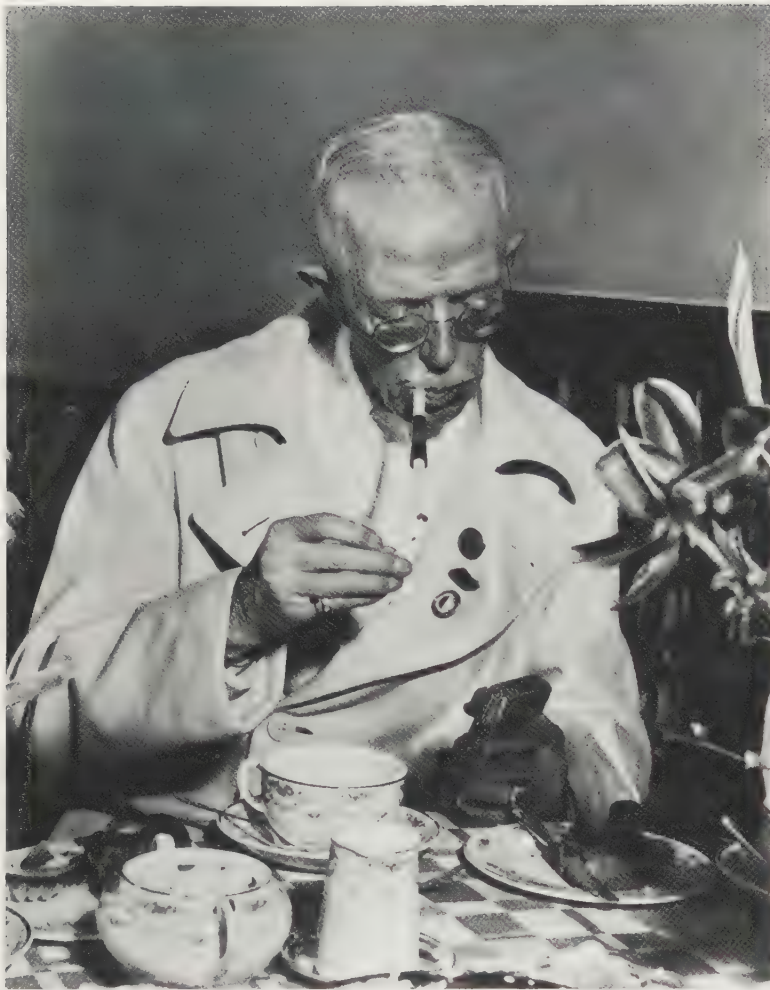
The coming of the Leica caused an awful lot of people to buy a camera – various categories of people. Before that, amateur photographers had come only from a certain segment of society. You can see that in the membership list of The Photographic Society Stockholm. They'd be engineers, doctors, and such, who could afford to buy cameras. They wouldn't be factory workers. Now, it was just the opposite.

Society wasn't as dynamic then as it is today; you can't compare the two. So subject matter for the press photographer was relatively limited. One didn't have time to get as much done, either. Let's not forget the fires. Things burned better before: The Djurgård Theatre, The Swedish Theatre, and The Galley Wharf are fires that come to mind.

The newspapers started containing more pictures. If there was a murder in Stockholm, well, the whole front page of *Dagens Nyheter* would be devoted to it, and it would be followed up in detail, day after day. Nowadays, when people murder each other, you just get brief news items. All events – like bridge dedications, where there'd be plenty of royalty – would be photographed. Now remember that we had 12 to 15 royal personages, and photographing royalty was something special. Then there were sports events.

*Were you at Stockholm Stadion in 1934 when von Wachenfelt won the relay?*

Yes, I was, and it wasn't something one forgets. I also witnessed the Nurmi events – I think they were in 1925, possibly 1926, when Nurmi competed against Vide. Just the two of them, alone. The Stadion was ready to burst. Sports photography was fun. It was something Victor Malmström was a master of. And, eventually, I, too, learned to follow movement with the



*King Gustav V of Sweden relaxing after a tennis match. 1936*

camera. The darker it got, the longer exposure times were needed, and panning with the movement wasn't very easy. Later, I took a lot of fine pictures using flash. It's a shame I don't have one single picture of when I got my first electronic flash, an English unit the size of a crate and weighing 20 kilos. But you could say that it opened a new era.

In The Photographic Society Stockholm, we'd have some three to four meetings per month, at Konstnärshuset (Artists' House). They'd be packed with people. Lectures were held by John Hertzberg or Helmer Bäckström, and all of us young people would be waiting the whole time for when Thure Sellman would ask for the floor. He was always critical. He was the opposition, and it was fun. It set off our imaginations. Afterwards, most of the people would go home, but maybe 20 or so would stay on for late supper – and then we'd just keep sitting there, talking. After the supper was over, we'd go to one of the studios and continue and never go home. I suppose we had a few drinks, and we talked. We'd be at Wahlberg's, we'd be at Bergne's, where we learned a tremendous amount and talked straight from the shoulder about photographers and photography. It was a time that, naturally, I only now, afterwards, realise the value of. I don't know if that sort of thing takes place anymore nowadays.

*You've mentioned a couple of idols: Victor Malmström, Gustav Rydén. Did you have any other teachers aside from relatives?*

No, I didn't. What I learned at home were the basics. It wasn't long before I had to go out and pick up a lot of my knowledge on my own.

*We've also noted that you are an active contributor to the Fotonyheterna, and that you wrote prolifically before, as well. You possess quite a fund of interesting general knowledge, and you have specialised knowledge far in excess of what photographers generally possess. It's interesting that you've written in Fotografisk årsbok (Photographic Yearbook) about collecting photo literature*

I have collected photo literature, but in different periods, alas. I didn't start collecting till the '50s, but there's not always enough time. I did manage to get hold of a few nice things. I was at Gernsheim's home in London, and he had everything! He'd gone from secondhand bookstore to secondhand bookstore and from junk shop to antique shop just scooping up everything. Because nobody wanted that stuff then. Bäckström's Collection could've been much better if he'd had the time and opportunity to really dig more. Naturally, he collected a lot here, and that was a worthy accomplishment

*It's precisely that vast experience you've gathered – not only concerning photographers, but generally – that one notices in every issue of Fotonyheterna: your knowledge of art, for instance*

I try to keep abreast of the times. It's not difficult keeping up, but understanding all the new stuff – that's something else. I rake the wilder photographers over the coals a bit now and then because I find it awfully hard to understand their complaints about having to work commercially. What kind of nonsense is that? I get the feeling they think one should have a living, but that it's somehow infra dig to work for money. They want to really let loose – but they can nowadays, with all the stipends available, and there's nothing wrong with that.

In 1930, when we founded The Press Photographers' Association, there were seven of us who wanted to try to obtain better prices and to be well received everywhere. Afterwards, I helped found The Picture Suppliers' Association. Apropos the former, I have a funny story to tell. It was in 1934 that I went into business for myself. Naturally, I didn't mention that in advance to my colleagues. But in the autumn of 1933, I was working very energetically to raise our fees, and I'll never forget when someone said to me in January: 'No wonder you made such a fuss to get our prices up!' That's what I call practical idealism

*Did you negotiate to obtain those fees?*

No, not then. A price list was worked out, and copies of it were sent out, and it was accepted pretty much until negotiation started. And that wasn't till the '40s. Finally, the newspapers realised that something had to be done. And it brought a little order to things, too

*Curt Götlén says that you did an enormous amount to create a national norm within the Association*

Well, I suppose I did – if one departs from the purely photographic. He'd probably noticed that I was terribly interested in precisely such organisation, because The Swedish Photographers' Association had not yet begun to keep up with developments. We made a dummy to show how the magazine ought to look. Edvard Welinder and I showed it to Ernest Florman, who was 80 at the time – a very, very, fine gentleman – because he had, after all, been attending to that matter for many years. He leafed through the little dummy and said: 'But this is simply marvellous!' And that was pretty typical of him, as a matter of fact. The period during which I collaborated with Florman – until he died, in 1952 – was probably one of the most wonderful periods I've ever experienced. We met once a month and did the page make-up for the magazine, and we did that at Esselte, the printing company. Of course, there were awfully few columns, but I'd obtained material and pictures. So we'd make up the magazine and then go out and eat lunch.

The stories he could tell! They were really fun! Once, while we were walking along Birger Jarlsgatan, it just so happened that he greeted two people relatively simultaneously. And I said, 'Wow, you sure do know a lot



*Crown Prince Leopold of Belgium on his way to Stockholm to marry Princess Astrid. 1926. Story below*

of people!' 'Yes,' he said, 'but it's nothing like before. Then, I knew everybody.' Well, that was in the days when salons were held at the Florman family home. There'd be Ernest's father, Captain Gösta Florman, who'd helped found The Swedish Photographers' Association in 1895. And there'd be the real Court Photographers. Ernest even got to help teach Queen Victoria and her ladies-in-waiting how to take pictures.

We really liked him, and, naturally, that was not least because he realised that a new era was at hand. Certain of the new photographers, he didn't really care for. I suppose he may have found them a bit too unpolished.

*You had an eye for what would look good in newspapers. Belgian Crown Prince Leopold in Södertälje – that must be a typical press-photo tale, right?*

Yes, that was my big scoop! He was coming to Stockholm to marry Princess Astrid.

*Yes, it's fairly typical of you to have been able to see ahead, both in time and space, and do a thing like that!*

It was absolutely incredible. It happened in 1926. We knew it was going to be hard capturing the royalty that was arriving. I rode down to Södertälje South and stood there shivering that morning. When I saw his chauffeur and car, I realised it was the chance of a lifetime. And as Leopold came walking along the platform, I managed to take three, four, five pictures,

running backward and exposing at maximum lens aperture and full shutter-screen opening. After I'd taken those pictures and he'd gone down to his car, I simply asked him to stand there, to pose. So there's a posed picture, too, of the Crown Prince and his suitcases. It's a nice, sharp picture. And then, heart pounding, I jumped up onto the train. And then, as it came gliding into Stockholm Central Railway Station, all the photographers were standing there, waiting! But, of course, I still hadn't developed my pictures!

*That's an important point you mention just now: this thing about having to wait till the film gets developed. Have you also experienced that terrifying feeling of having been in on something big and then having to wait some time before finally getting to soup your film?*

Well, I don't think photographers go through that these days. They work with stuff that's technically perfect. They're not in that kind of situation. When Sandels Illustrationsbyrå eventually got going in 1934, we took a lot of sports pictures for one thing. Sven Malm was great at that. We were known for making good prints, and it was said that on Sunday evenings newspaper editors would wait until our pictures arrived. I even believe that Molander made a developer according to our formula. The whole secret of the thing was our negatives. We used a very fine Ilford Paper. We knew precisely what could be achieved with it. It was a matter of developing the negative to suit that paper. That was the whole secret. During my Association time, I saw so many bad negatives in portrait photographers



The Sixth of June: the Swedish Marines/Danish the Olympic Stadium, Stockholm, 1926

studios that it scared me to death. They were over-exposed. So they were forced to seek out a suitable paper. Well, that was all wrong, of course. They already had the paper. It was the negative they should've been working on. Developing was the most important thing of all. You had to obtain a negative that was just thin enough for all the details to be present, but for nothing to have become blocked. Don't think that I, too, haven't had over-exposed negatives that I'd have needed a sledgehammer to print through. It really got you down when that happened to you.

I suppose I can say something about my Association work. I left the profession of photographer simply because it was clear to me that I could accomplish a bit more in the field of photography by first becoming Secretary and then President of the Association. It was a larger task. Whether it was a correct decision or not is debatable, I suppose. But I definitely believe it was correct because, well, I guess I was tired of taking pictures, too. I'd been at it for so long, and who says that just because a person happens to be a photographer he's got to keep doing the same thing all his life? Through the Association, I also got into magazine work.

*That was an early transition you made. You were only 36 years old when you started with The Swedish Photographers' Association.*

Yes, but I still had my firm. I couldn't live on my Association salary. It's just that I didn't do anything at the firm after that, because the Association interested me more. But I don't think I started receiving a normal, labour-market-level salary from the Association till 1950. It was decided at the annual meeting in the spring of 1942 that I should receive 500 crowns per month. At that point, a female member stood up and said she couldn't understand why they should pay anything; they had never paid any of their secretaries before. So, in that connection, too, it was a time of change.

That the Association developed during Edvard Welinder's and my time into a proper professional association is no exaggeration. Since then, an awful lot has happened.

In those days, there were only portrait photographers. They stayed on their premises. Now, photographers wander all over the world, and you can never get hold of someone when you want him. The structure has changed. For several years, we arranged courses at Swedish Government Institute for Handicrafts. We put together a fine picture collection, which even got exhibited in the US. We participated with an interesting wall in 'Kamera 55' in Gothenburg, a photokina in miniature. It was Arne Wahlberg and I who selected the pictures we regarded as most representative of the various branches of professional photography. We made a layout with pictures in various sizes – made a composition of all the picture material. Then we borrowed the negatives from the photographers and printed the pictures centrally. It made a fine wall. It was an original concept. I suppose the odd photographer here and there seethed a bit. But I had 1200 clients, so I was pretty thick-skinned by then.

In 1926, there was an international soccer match between Sweden and Denmark. It was held in Copenhagen. And, since we were a modern newspaper, we were going to bring back the pictures by plane. Otherwise, the pictures would only arrive in time for the evening papers. Albin Ahrenberg was commissioned, and he picked up Oscar 'Glokar Well', Söderlund and yours truly in Copenhagen. It was foggy as the dickens, so he followed the coast up. But by the time we'd reached a point a bit north the island of Öland – the place was called Figenholm, incidentally – he couldn't continue and had to make an emergency landing. So the next day's edition of the paper featured a half-front-page shot of us, instead. Air drama with a forced landing – that was news in those days; from such events came reportage photos!

I got married in 1930. On Tuesdays – my days off – my wife and I would go out strolling, and I'd take a few 'genre' pictures, which I sold to the Co-Op magazine, *Vi*. They paid well, you see: 100 crowns. That was a fantastic amount of money then.

The Ica Minimum Palmos was the best camera I've ever had. I loved that

camera. You never talked about exposure times. Instead, you'd say, 'Sha we shoot with a 30mm silt?' That was the shutter aperture. We even adjusted the speed. You disregarded everything that indicated times and such. You had it in your fingers in another way. Oh, of course, it was chancy, but oddly enough, it did produce pictures.

Courses and lectures, I've held throughout Scandinavia. I've been at it far too much. During the years 1942 to 1960, I was course leader and course instructor at Swedish Government Institute for Handicrafts, and I've lectured in all the Nordic countries.

*In what year did you start your magazine Fotonyheterna?*

In 1961. So this is volume 18 that's about to start now, and it's been a tremendous success. It's entirely professional-oriented and available only by subscription. Naturally, we have some amateur subscribers, but the amateur wants to see pictures, so it's on a different level. So were alone in our area. Of course, we do compete for advertisers' money. We have a lot of ads, and that's because our advertisers know that the newsletter reaches the right buyers. Subscribers include advertising, industrial, and hospital photographers and all kinds of photo industries and photo dealers.

Our subscription lists include the entire industry. Now it's my son, Björn Sandels, and Hans Hollander who put the newsletter together. I keep essentially out of editorial matters because they see things in a more modern way than I do. There's a bit of an age difference, no getting away from it.

*You write the editorial, don't you?*

Yes, I do write that column – although how much longer that will go on, I don't know. But I enjoy it.

*We believe that our generation is in great need of being allowed to share the knowledge you present.*

Some times, I get the feeling I'm becoming a bit tedious. But I do know that the new generation doesn't know about everything. And I therefore feel that I have a few things to tell them. The various times of change ought to be illuminated – not preachingly, but just to indicate what took place. I've learned to be very careful about being preachy in life, because it's not always certain you're right – even if you're essentially quite convinced that 'I and a couple of others are the only ones who understand what it's all about.' I always joke about that.

Editorials aren't too common in photo magazines. I'm often critical in mine, but I'm very careful not to hurt anyone. It does happen that people get in touch, phone from Photography Centre, for example, and voice irritation at something I've written. I suppose I've paid a little extra attention to that particular generation, which deep down I admire, despite everything. Most of them, after all, intend something by their pictures.

The number of times some member from out of town has come up to me and told me of problems he was having in his studio! And I'd think to myself: 'How can this man be a portrait photographer? He can't even talk with me! How, then, can he talk with his customers?' It's just that when some provincial governor or doctor or station inspector would come to his studio, well, the photographer would feel small and insignificant. I felt that they lacked self-confidence, self-reliance. They'd say, 'I'm only a photographer'.

Naturally, things have changed now that everyone has a camera. Everyone knows what it's all about. But I think there are still people who turn up their noses at photographers. I'm afraid such people exist, unfortunately. Just look at how long journalists had to struggle for recognition. Penny-a-liners who'd take notes on their shirt-cuffs! Now they're the ones who're in command. No one dares say a word against them!

*Did you ever travel, either to study or in the practice of your profession?*

No, at least not as a photographer. It wasn't till I started working for the

Association – and later as a publisher – that I began travelling all over the globe. Not as a photographer, because in those days, you simply didn't, that's all. When the war ended, all the young people set off abroad. That was something utterly new, and now, of course, it's commonplace. But before the war, no one had ever come up with the zany idea of travelling abroad to photograph. It just never occurred to anyone. In the beginning, of course, it was a financial matter.

Some Association photographers received scholarships. In fact, I was recently awarded a scholarship by the Writers' Fund. I was never so amazed in all my life!

*Have you received any honours or awards?*

I received the Florman medal in 1945. I'm an honorary member of The Press Photographers' Association, Bildleverantöernas Förening (The Picture Suppliers' Association), and The Swedish Photographers' Association. Oh, and I was given the Prisma award by The National Association of Swedish Photography, too. Prisma was very nice to get. I've entered one contest, in the '40s. The Philips company held a flash contest, and Sandels Illustrationsbyrå received first, second, and fourth prizes. I have a letter we had printed up and distributed as advertising. Aside from that, though, I haven't entered any competitions.

*Have you ever had pictures published in foreign periodicals or included in exhibitions abroad?*

No, not in exhibitions. But I have had pictures in some English yearbook. I wasn't all that interested. I think that's pretty typical of press photographers, because most of their pictures are pretty ephemeral. And no matter how good they are, it's not certain that they'll hold up in such contexts.

*We haven't spoken about outside influences, contacts with ranking photographers. In all your writings, one perceives vast photographic knowledge.*

My influences came from English press photography and from the German magazines. *Stockholms Dagblad* subscribed to the American *The Daily News*, which was part of the yellow press, as well as to all sorts of other foreign newspapers. There were pictures of gangsters and shoot-outs with police, and it was terribly exciting. One photographer who attracted my notice early on was Edward Steichen. He had fantastic pictures in *Vogue* and *Vanity Fair*.

*The photo salons that existed then, weren't you interested in them?*

I would always buy *Photograms of the Year*. I have a complete series of the old *Das Deutsche Lichtbild*, including the 1927 volume. That's the so-called unknown volume. I'd look at pictures, and there were some reportage pictures, too. More than anything else, the pictures were awfully well executed technically. That was the Germans' forté. Somewhat dull pictures, perhaps, but technically they were skilfully done. I'd look to see what lens had been used and what developer, just as all young photographers do.

*Have any particular schools of composition or form meant anything to you?*

Yes, I can mention that when I photographed a crane in Visby in 1932 from below my wife was standing next to me and said, 'What are you photographing that for?' It was the new objectivity. That's true. There's no getting away from the fact that one is influenced by such things. I had a picture that I took out at the Royal Motor Boat Club dock, showing a row of buoys. That sort of thing is very apparent in Emil Heilborn's photographs, for example. But reportage photography was affected very little, because one was bound by events in a different way.

When it came to other kinds of pictures, for magazines and such, I also took 'genre' pictures, too, which I tried to sell. As for *Die Neue Sachlichkeit*, many of us were influenced by it, because it was something utterly new.



*The Royal Guard on their way to the Palace in Stockholm*

And, of course, it affected advertising photography. One was supposed to make effective pictures, pictures that attracted, pictures with impact. In conjunction with the Stockholm Exhibition, an awful lot of things like that came out.

*Can all that be traced to what we nowadays call functionalism, the whole style?*

Well, a great deal of it, naturally. At the Stockholm Exhibition, there was a special salon featuring all ultra-modern art. But, clearly, it influenced a lot of things across the board. I think the advertising picture played an awfully big role. It came into everything. I've taken advertising pictures, too. We did so at my agency, but not to any great extent, I don't think.

*What did you think of the exhibition The New Eye of 1939?*

Well, I have no memory of it at all. I suppose its chief significance was that it meant photography was getting noticed and written about in a serious manner. Gotthard Johansson wrote a lot about photography. He liked photographers. And then came Ulf Hård af Segerstad and the others. Gotthard Johansson was the first.

Earlier, people used to hold salons featuring fine pictures, which were supposed to imitate etchings and all kinds of things. And, of course, the



'reviews' were little pats on the back. The pictures were pretty and neat and skilfully done. But I think that, in that case, *The New Eye* signalled recognition of the fact that it had been 100 years since the invention of photography, and the exhibition was treated seriously.

Then, right afterward, came the war, in which photography played an incredibly big role. Not least Gullers did an awful lot during Sweden's War Alert years. I, myself, was conscripted as a staff photographer. One reportage that attracted a lot of notice and was even published abroad was about the 'Grouse Hunters' somewhere in Norrland. I was up there with Sven Aurén. We were supposed to do a reportage on the so-called 'Grouse Hunters', a local military unit. The guys were from that area and had been equipped with fish hooks and grouse snares so as to be able to live off the land while on patrol in their white, hooded uniforms.

*Was that to strengthen War Alert morale?*

Yes, naturally. It was sheer propaganda material, you could say.

*You once took a great picture of a soccer goalkeeper.*

Yes, that picture's quite strange, because it makes one wonder whether the goalkeeper's looking at me or at the ball. I can't remember whether the ball went in, but the picture's kind of fantastic. It's an example of quick reflexes,

'cause those things happen fast as all get out! So you can naturally say it's largely a matter of luck, too - 'cause you've got to have luck.

*That's also characteristic of a lot of Eric Collin's sports pictures*

He was brilliant. It was in the '40s or '50s. He took lots of fine pictures. These sports photographers, they come and go. As youngsters, they take pictures from new angles and everything - because there's always new angles, no matter how many angles have been used before. But, finally, you just can't hack it anymore. You're worn out, so to speak. So you quit photographing sports and go into other things.

Obviously, those years I was on a newspaper were something special. I mean, I knew that whenever something happened, we'd know it before anyone else. Eventually, of course, you become inured. I think press photographers, some of the ones we have today, are incredible. Take Anders Engman, for example. I mean, he's unique. Now, of course, some old photographer can come along and say, 'Yes, but they get to travel all over the world.' Yes, they do, but they make use of that advantage in the proper manner, too. *Dagens Nyheter* has a lot of them, like Sven-Erik Sjöberg and Leif Engberg, who go out and really come home with something.

I admire these young photographers of today. They really know their job.

# EPITOME OF PROGRESS

## EDUCATION

The DES discussion document of February 1978, 'Higher Education into the 1990's' attempted to predict the future total numbers of students from traditional sources attending full-time and sandwich courses of the traditional pattern. Given the known variation of birthrate up to 1977-78, the variation in the population of eighteen-year-olds was predicted with some certainty up to 1995-96. In graph form, this showed a sharp peak in 1982-83 which fell steeply after 1990-91. A decline had also occurred in the period 1965 to 1970 but the total number of higher education students had increased because of a large increase in the proportion of young people entering higher education. The proportion, known as the Age Participation Rate (APR), increased from about 8% to 14%. Predictions of numbers of students depended upon assumptions of the way in which the APR was likely to vary. Three assumptions were made, each implying an increase in APR up to 1994. Each of these assumptions resulted in a 'hump' in the curve, the peak occurring between 1984 and about 1990. Each assumption implied declining numbers after 1990.

A second DES discussion document, 'Future Trends in Higher Education', was presented as a conference report in March 1979. This sought to update the predictions in the light of a decrease in the APR between 1977-78 and 1978-79. Three new assumptions were made in which the APR was assumed either to rise slowly, to decrease slightly then recover, or to decline. This revision suggested that the original planning figure of 560 000 students should stand but should be set for 1982-83 instead of 1981-82. This figure compares with 508 000 estimated enrolled students in 1978-79. This target implies growth of 21 000 in the universities and 31 000 in the public sector of advanced further education. The period beyond 1982-83 was seen to be one of increasing uncertainty.

It would appear impossible to assess the validity of these DES assumptions. The number of eighteen-year-olds who will wish to enter full-time courses in future will depend on many factors. These must include employment prospects both generally and for graduates and diplomates, wage and salary differentials, differences between salaries and student grants, the success or otherwise of comprehensive secondary education, the effectiveness of policies for sixteen to nineteen year olds, recruitment policies adopted by employers, and regulations for admission to membership of professional bodies. Despite this uncertainty, even the most pessimistic commentators anticipate some rise in the number of full-time students up to about 1984-85.

Photographic education and training in all its forms, along with all other subject areas in the further and higher education sector is reconsidering its courses in the light of the requirements of such national validating or examining bodies as the Council for National Academic Awards, Technician Education Council, DATEC, Scottish Technician Education Council and the City and Guilds. Both the teaching and medical professions have attempted, albeit very inaccurately in the past, to produce manpower projections. The difficulty of achieving this can be measured against the very fluid DES overall projections. The photographic profession, by its very character and scope, must be prepared for very inaccurate projections.

In presenting the opening address at the conference 'Photographic Education in the 1980's' held in April 1979, David Bethel, the Director of Leicester Polytechnic and the Chairman of the CNAA Committee for Art

and Design indicated some pointers to be considered in preparing courses in photographic education and training:

'Susanne Langer . . . . . wrote of philosophers that "their function is to increase not our knowledge of nature, but our understanding of what we know"'. That I believe to be the main role of undergraduate education, to teach in ways which cultivate an understanding of what is known. The increase of knowledge is the prime role of post-graduate education. The essential difference between training and education is that training seeks to give the acquisition of those skills which will increase the efficiency of the performance of the individual, whereas education seeks to teach in such a way as to promote the general powers of the mind in order to create understanding of what is known. This essential difference is important but, as those of you concerned with photographic education will know, training and education are not necessarily separate activities. They can complement each other in ways which allow a more efficient acquisition of skills and a more imaginative application of knowledge.

'The task facing the colleges is to find ways of teaching more systematically so that the learning process is more effective and ensuring that both the teaching and learning processes are appropriate to students' needs. This means that curriculum designers must be clear about the objectives of the curriculum and build in monitoring and evaluation systems to test that the curriculum is being taught efficiently and that students are learning effectively

'The teaching and learning of skills lends itself to a system approach and this can easily be associated with the process now known as Educational Technology. The implications of the application of micro-processors to education are enormous. Their exploitation will call for a much clearer conception of what should be taught and how people learn . . . The effect on all subject teaching is likely to be dramatic.

'Whilst the application of microprocessors to the teaching of skills is almost self-evident, their application to the education process is more difficult to determine. At this point I must now narrow this address and try to place photographic education in a context for the 1980s. At degree level, in the maintained sector, photography is now under the CNAA Committee for Art and Design, which I chair. The courses range from those based on the study and application of mathematically and science-based concepts which are needed when photography is used in aerospace and space satellite photography, and those which teach photography as a medium of expression. Between these two poles are courses which teach photography as a tool to be used by artists and designers. Art and Design degree courses are undergoing changes and I detect (and welcome) that the range of these courses is extending towards the polarities established by photographic education.'

In March 1979 the Associated Examining Board held a two-day conference for teachers of GCE 'O' and 'A' level photography. Its purpose was to attempt to overcome dissatisfaction of both the form of the examination and the criticism of the level of the 1978 marking. Statistics from the conference showed that in 1978, 2415 candidates took the 'O' level and 405 the 'A' level, so almost doubling the figures for 1975. The suggestion was made that both the Cambridge and the London examination boards were considering adding photography as a subject to their lists.

The IIP conference 'Photographic Education in the 1980's' was held at Twickenham in April. During these two days there were statements from the validating bodies on present and future policies; papers presented on

trends in learning methods and recent technology, the employer's contribution to education and training, post graduate qualifications and research, professional needs and career opportunities, and course management.

At the time of writing the 'International Photographic Conference' is to be held at the Camden Arts Centre during June and July. The seven day 'Photo-education' section of the conference plans to discuss 'The international status of British photo-education'. The discussion will concentrate on photographic education at graduate and postgraduate level, the establishment of a Chair in photographic criticism, and postgraduate research possibilities.

The Technician Education Council announced in June 1978 its initial proposals for reorganising vocational art and design courses. The proposals were prepared by the Art and Design Committee of TEC (DATEC) which recognises that it will eventually be required to consider validation of any course, other than those within the remit of the CNAA and the universities, which is concerned with the visual, manipulative and creative studies and experiences required to meet industrial, commercial and professional needs. Photographic studies will be administered by the Graphics and Visual Communication Area Committee which embraces such areas of study as graphic design, illustration, typographic design, audiovisual techniques, photography, film and television.

DATEC and its subject area committees published, in April 1979, guidelines for colleges to prepare their submissions for validation for starts in Autumn 1980. The proposals allow for development of courses of an integrated nature, known as the 'grouped course scheme', which reflects the approach to the majority of current Art and Design studies. Alternatively, courses may be designed as 'unit-based programmes' which may reflect the character of particular subject areas and requirements for a flexible credit award system.

The City and Guilds of London Institute has announced its new schemes for photographic subjects. These schemes for courses of part-time study and related examinations are intended for students who are employed in the photographic industry. The 744 General Photography Certificate and 744 General Photography Advanced Certificate are intended for those employed as photographers, studio assistants or printers in the fields of portraiture, commercial, advertising and fashion photography, and photo-journalism. The 745 Scientific and Technical Photography Certificate and 745 Scientific and Technical Photography Advanced Certificate are intended for those employed in photography and as technical staff in industry, hospitals, research and allied fields. The first examinations for these new schemes are scheduled for 1981. The last examinations for the 'old schemes' have been planned in the case of Certificates for 1981 with re-sit in 1982, and in the case of Advanced Certificates for 1983 with re-sits a year later. In the longer term City and Guilds are proposing to withdraw their 744 and 745 photography schemes and are considering introducing photographic courses and examinations of a non-vocational character.

The influence of the Printing and Publishing Industry Training Board's Photography Training Section has gathered momentum. It offers a systematic approach to planned training with its 'Timesaver Training Units'. These units sub-divide processes or techniques into their component skills which are then broken down into individual operations to be undertaken. There are twenty-five units; seven concerned with taking photography and covering areas such as 'general photography', 'social photography' or 'advertising photography'; and eighteen involved with laboratory skills from 'chemical mixing' to 'print finishing'. A series of 'Phototraining Workshops' held in venues throughout the country offer courses as diverse as 'Marketing and Selling', 'Effective Supervision', 'Location Lighting', 'Assessing Colour Printing Quality', and 'Basic Theory for Photo-Lab Staff'. These courses are devised by the PPITB for implementation by other organisations including professional bodies, educational establishments, manufacturers and suppliers.

There have been several changes in the courses recognised by the

Institute of Incorporated Photographers. The following courses and institutions are recognised for the 1978 intake of students at Professional Qualifying Examination level: Diploma in Creative Photography (full-time) at Trent Polytechnic in conjunction with the Derby Lonsdale College of Higher Education; Diploma in Photography (full-time) at the Bournemouth and Poole College of Art; Diploma in Photography (full-time) at the West Surrey College of Art and Design; Diploma in Professional Photography (full-time) at the Salisbury College of Art; Diploma in Applied Photography, Film and Television (part-time) at the Harrow College of Higher Education; and the PCL Diploma in Professional Photography (part-time) at the Polytechnic of Central London. The following are recognised at Vocational level: Diploma in Vocational Photography (full-time) at the Berkshire College of Art and Design; Diploma in Vocational Photography (full-time) at Blackpool College of Technology and Art; Diploma in Vocational Photography (full-time) at the Glasgow College of Building and Printing; Diploma in Vocational Photography (full-time) at Gloucestershire College of Art and Design; Diploma in Photography (full-time) at the Kitson College of Technology, Leeds; Diploma in Vocational Photography (full-time) at Napier College of Commerce and Technology, Edinburgh; Diploma in Vocational Photography (full-time) at the Plymouth College of Art and Design; Diploma in Vocational Photography (full-time) at West Bromwich College of Commerce and Technology; and the Certificate in Vocational Photography (part-time) at Richmond-upon-Thames College.

For some while the Society of Photographic Education has been considering its future role. It identified the need for the setting up of an unaligned information service with a broad base of reference. It became aware that the assembly of the wider-ranging and high-level talents that this would involve would inevitably generate a climate of opinion, as well as information; and so provide a valuable new voice in areas of photography presently neglected or monopolised. To achieve this end SPE has resolved that the Council for Photography (CFP) be set up, to supersede SPE and to operate initially in an informational mode, with the intention that the opinion formation and public discussion shall arise naturally out of its basic function. Unfortunately, the formation of CFP, through a clearly identifiable need, has left a vacuum in the specific area of photographic education.

At the end of March 1979, the Council of the Royal Photographic Society agreed to go ahead with its plan to create a National Photographic Centre in Bath. The decision was made with the knowledge that nearly £200 000 of the £300 000 appeal had been raised. The centre will be based around The Octagon in Milson Street, Bath, and will include exhibition galleries, library, lecture theatre, a shop as well as the RPS Headquarters. The RPS collection of photographs, equipment and books will be readily available for research purposes. It is expected that in the future the Centre will have academic links with the University of Bath. It is anticipated that the first phase of the project will be completed in early 1980.

The DES has made its predictions up to 1995-96 on the total number of students in full time and sandwich courses in the public sector of advanced further education. Beyond 1982-83 these must be considered uncertain. For part-time initial and recurring education and training any prediction is virtually impossible. Course planning will be influenced by social, economic and technological change. Political change also brings sharp reversals of educational policies and attitude at national and local government level. Validation procedures are lengthy. If education in general and photographic education and training in particular is to respond to rapidly changing needs, it must itself be perceptive, responsive and innovative with future development based upon indicative planning.

**Michael Hallett**

# GRAPHIC REPRODUCTION

## Proliferation of activation and stabilisation systems

The system of modern stabilisation processing with its speed and efficiency is having a marked success and application in graphics technology. It is based on the fact that unlike normal photographic emulsion, which after exposure requires to be developed, fixed and washed, the developing agents are incorporated in the emulsion. The rapid development of the exposed image is achieved in a few seconds by using an activator solution in place of the developer to accelerate image formation. Conventional fixing is eliminated by using a chemical stabiliser.

Terminology can be ambiguous and confusing and expressions such as 'rapid access' and 'stabilisation methods' mean different things to different people. Historically, stabilisation is understood as a chemical treatment for the conversion of unused silver halide in a print into a more or less light-stable colourless compound, thus replacing normal fixing and washing, where speed, and not permanence of result, is vitally important. Thiourea, concentrated sodium thiosulphonate or thiocyanate, were the original satisfactory stabilisers. The term is also concerned with the after-treatment of colour prints and transparencies using an ultraviolet absorbent or a neutraliser for processing the chemicals left in the emulsion with the object of decreasing the deterioration of the dye. It is also used in emulsion manufacture in terminating the digestive process in emulsion making when the required sensitivity has been reached. This is done by adding stabilisers, for example in this instance, heterocyclic compounds of triazole, tetrazole, etc.

Stabilisation, as an alternative to removing unexposed silver halide using a solvent such as sodium or ammonium thiosulphate followed by washing, has the advantage of obviating the need for washing but limits the subsequent stability of the final image. It involves the formation of complexes with silver ions which are not sensitive to light and these need to be transparent and colourless and contain sulphur, carbon, nitrogen and hydrogen elements. For reversal processing the developed negative image is dissolved without affecting the unexposed silver halide by the use of an oxidising agent in the presence of a solution in which the silver ions are soluble, the usual solutions used for this purpose being potassium dichromate or potassium permanganate in the presence of sulphuric acid, followed by a sodium sulphite clearing bath.

Rapid access systems are photographic systems which produce a usable image in a very short space of time – usually in a few seconds. The sensitive materials are used with specially designed equipment and particular formulated processing solutions used at high temperatures (32° + C). In this category can be placed Diffusion Transfer Diazotype, Thermofax, Verifax, Xerography, Polaroid, and other systems. Used in the context of silver halide emulsions on paper, a developing agent is incorporated and the equipment involves a roller system plus an activator solution to induce development by the developing agent incorporated in the paper. This is followed by stabilisation in place of fixing and washing and the print emerges slightly damp in a matter of seconds. The sensitive materials – either paper or film – have the developing agents, such as hydroquinone, incorporated in the emulsion, and processing is carried out by passing the materials in a specially constructed processor through an activator solution of sodium sulphite and sodium hydroxide at a pH of 12–13 and finally through a stabiliser solution. The system provides a rapid means of processing, although it is found that the image is somewhat unstable in that the silver image may bleach and the whites turn yellowish. The introduction of resin coated (RC) paper, onto which the silver halide emulsion is coated in conjunction with rapid processing equipment yields a dry stable print in about 90sec. The paper is coated on both sides with a polymer and the silver halide emulsion deposited on it in the normal manner. A short wash

removes the residual processing chemicals which are not absorbed by the paper and dimensional stability and drying speed are commendable.

Conventional photographic processing involves development, fixation and washing; processes which are time-consuming and require controlled techniques for success, plus a fitted darkroom with adequate plumbing and water facilities. The introduction of rapid access procedure and chemistry has been found to provide very good chemical stability, eliminating many of the processing problems associated with correct replenishment and consistency, so that the need for complicated, highly technical and expensive processors is avoided. The non-use of infectious type chemistry, as employed with lith type development, simplifies replenishment problems and eliminates most of the problems of aerial oxidation associated with lith chemistry. With some of the new processors replenishment is not involved and a large volume of chemicals is used until exhaustion. This also applies with stabilisation systems, although in the more recent machines the principle is to inject electronically a fresh supply of chemicals to replace a similar quantity of used ones.

## Screen process and instant print developments

Much interest has been aroused in the assisted drying of printed matter by UV or IR radiation. It is apparent that these innovations influence only a small proportion of the print market and the traditional drying methods of absorption, penetration and oxidation on drying are the main factors considered by most printers when purchasing their inks. Modern inks contain less oil and formulation improvements have ensured that drying is less of a hazard than in the past. Screen printing is no exception, although recent developments in fully automatic press lines have evoked an interest in UV curing technology for the screen industry and UV curing reactors have been introduced. If assessed by modern printing technology standards the screen printing industry employs little sophisticated equipment except in a very few of the larger and more highly mechanised plants. It is, in the main, a 'small shop' industry, employing from one to five persons, using basic techniques including manual printing and rack drying with some jet-air type dryers. The larger establishments cater for the long run market and employ automatic stencil processors and the recently introduced screen printing web press, which can be set up as a two-station two-colour combination with intermediate drying units. For industrial work fully mechanical machines are available operating at 3600 iph, and self-feed units can be fitted. The production of sublimation transfers for fabric printing is now big business as also is T-shirt printing.

It is not always realised that the versatility of screen printing is such that fine type matter can be reproduced quite satisfactorily. The day has passed when the process was confined to poster and display production or fabric and textile printing. The advent of the carbon tissue stencil and other photo-stencil systems plus the employment of camera-made positives revolutionised methods and techniques and the introduction of dry-transfer systems, such as Letraset and finally photosetting developments have coincided with the remarkable advancements in screen printing press performance and drying. Quality printing is now possible and type face as fine as three-point can be screen printed to give results equal to the best of letterpress printing. Obviously press speeds are relatively low in comparison with letterpress or offset for long commercial runs but for short runs up to a few thousand, cost advantages are quite considerable and screen printing could be used with advantage for good quality book production where the printing edition is in the region of two or three thousand copies.

Copiers are an essential aid to printing both for the small offset user and for large offset and general print and office needs. A photocopy is a necessary requirement for estimating or invoicing purposes, for preparing layout and artwork assembly and for obtaining galley and page proofs of photoset matter for customer and pre-print checking. The need for a copier is apparent; choosing the particular equipment which will prove the most satisfactory to accommodate a particular requirement, or alternatively for a

diversity of purposes, can be an involved procedure. They can be bought, leased or rented and an efficient maintenance service is essential. Copiers are marketed in various sizes and can provide multiple copies with automatic control, or simply one-off copies and several systems are available. The major process is by electrostatic transfer, which can be either direct and use coated paper, or indirect using plain paper. With the direct method the image of the original is projected onto the copy paper, which is coated with a photo-conductor and light action induces an electrostatic charge which attracts particles of black toner held in suspension in a liquid. The toner adheres to the image and is fixed by heat or pressure.

Another type of copier requires sensitised paper and is based on the thermal process, whilst the dual spectrum system also uses heat but only as one aspect of the exposure procedure, the other part using light action. These latter copiers use no chemicals inside the machine and are relatively cheap and simple to operate. However, they only provide one-off copies and, in the case of the thermal method, they are affected by sunlight. The diazo-process employs a chemical procedure using a sensitised paper and ammonia vapour. It can produce copies at very high speed, in large sizes and at a low cost per copy. The diffusion transfer system produces copies on coated paper from a sensitised negative in a developer bath and whilst copy quality is good and obtained at comparatively low initial cost, two special papers are required, darkroom storage is needed for the light sensitive negatives, and most of the equipment marketed provides only one-off copies. The magnetic dry toner copier method is one in which the image is imprinted on a coated paper by a magnetic powder ink. It uses a coated paper and is fast and dry and capable of multiple imaging. The growth rate of resin coated (RC) paper in the phototypesetting field is phenomenal and most users employ stabilisation methods with paper exceeding film in a ratio of ten to one. The introduction of stabilisation chemistry has made available a low cost processing facility for present-day phototypesetting.

## Flexography

Flexography will probably become the major relief printing process within the next decade. At the present time orthodox letterpress printing accounts for three times the volume of work at the moment produced on flexo machines, but the impact of photopolymers is gradually altering the balance in the relief printing fields in favour of flexography. Rubber stereotypes are being superseded and organisations like Du Pont with their 'Cyrel' flexographic photopolymer plate are responsible for this change. 'Cyrel' plates are not just another substitute for rubber stereotypes but are part of a cost-effective system for the plating of flexographic presses. Quality of result is superior and the image is transferred straight from negative to plate, accurately recording the fine detail of the artwork. This has a distinct advantage over the variables in size and quality inherent in the old method of producing rubber stereotypes moulded from a zinc plate master. The plate consists of a transparent photopolymer layer on a dimensionally stable polyester base. A 'Mylar' film protects the surface and is peeled off before exposure. Unlike rubber it is prepared directly from film negatives and no engravings are required. Exposure through a line or halftone negative hardens the photopolymer in the image area and the remaining area is washed out in an automatic processor. The plate is then dried, surface treated and given a final UV exposure to harden the image.

The equipment available exposes, automatically processes and dries the plates in about 30 min. Tolerance limits within a plate are  $\pm 10 \mu\text{m}$  (half a thou) and no shrinkage occurs during 'processing' as the polyester base ensures good dimensional stability even after repeated mounting on the plate cylinder. Printing run lengths of half-a-million impressions on paper and  $1\frac{1}{2}$  million on film are possible and high quality work in two and three colour printing, which was previously not possible, is standard procedure. BASF Nyloprint systems have recently introduced their new flexo printing plate complete with processing equipment which enables the printer to

make plates direct from film, thus speeding up production steps over normal flexo platemaking methods. Their established Nyloprint systems for newspapers now include Nylomat 20 and 40 in solid and liquid forms and Nylomat 80 which is a solid system. Their effectiveness is enhanced by the use of the commendable Nylospeed register systems. Uniroyal have introduced their Flex-light continuous print photopolymer and processing equipment, which has a special application and advantage for flexography, since the photopolymer completely covers the printing surface of the rollers and produces an image without a gap along the whole length of the web. This is a necessary requirement in the printing of textiles, wallpapers and in-line packaging printing from the reel. The Flex-light rollers are available up to 250 cm wide and up to 650 mm in circumference, with larger sizes to be made available. The photopolymer can either be factory coated directly on to the flexo rollers for exposure, washout, post exposure and drying, or can be applied to a glass fibre sleeve, which is then slipped round a roller.

The use of an automatic laser engraving machine indicates the possibility of even higher quality flexographic printing at lower cost. The new Zedco laser engraver provides automatic jointing and is a one-step operation. A helium neon laser head scans or reads the original artwork as it revolves on a roller, storing, and then matching the data to the  $360^\circ$  rotation of the printing roller to provide perfect jointing of the image on the rubber roller. Complex processing information is transmitted to the  $\text{CO}_2$  laser, which then engraves the rubber automatically. It functions at high speed at two engraving depths, each adjustable to suit the work in hand. Rubber with very fine resolution can be engraved in an hour and a quarter and seamless jointing is achieved by the scanning head reading two lines on the artwork and not printing anything outside those lines. Step-and-repeat facilities will be available and a magnetic tape variation, which means the complete separation of the reading or scanning unit from the engraving unit. The reading unit output on magnetic tape is transmitted to the engraving unit, with the advantage that the two operations can be carried out in isolation, i.e. in separate premises or areas.

## Lasers

Fourth generation photosetters not only compose characters at much higher speeds but, because of the extremely fine spot produced, the definition and sharpness of the characters is vastly improved. The Lasercomp uses a stationary helium-neon laser which generates a pure and constant beam of red light with an ultimate dot size of  $0.025 \text{ mm}$  ( $0.001 \text{ in}$ ) and writing resolution of 394 lines/cm (1000 lines/in). The diameter of the beam leaving the laser is approximately 2mm and ultimately it will be possible to produce halftone illustrations direct from the photosetting device itself.

The five most frequently found lasers at present are the helium-neon, neodymium-glass, carbon dioxide ( $\text{CO}_2$ ), argon-ion and the semi-conductor diode. The most numerous is the helium-neon laser with the laser medium, a gas, contained in a tube and excited by an electrical discharge very similar to a fluorescent lamp. In the graphic field it is used to electronically transmit and receive images. The argon-ion gas laser can be made to produce a number of individual colours in the visible and ultraviolet and when used as an 'optical pump' the tunable dye laser gives out laser light whose colour may be tuned as required. Lasers are devices which generate 'coherent' light. Thus the problems associated with normal light sources, which have random wave-forms with no specific phase relationship, are eliminated. A light ray with virtually no dispersion is produced, which means that from source to reception point, the ray maintains the same diameter. When a laser beam hits its target it can produce such energy that the substance is vaporised without leaving any residue. Thus its use for precision drilling and etching, for message transmission systems and its tremendous future potential for direct screening in the field of electronic scanning developments

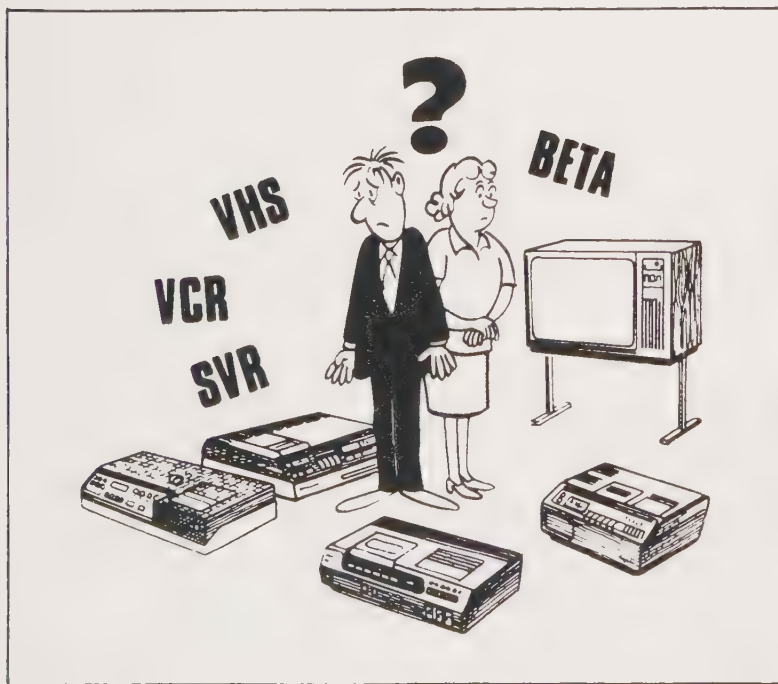
**Eric Chambers**

# AUDIOVISUAL

The review of the audiovisual scene in the 1979 *Annual* (pp158–159) was criticised for its sceptical attitude towards the prospect of video developments. In retrospect, that criticism now hardly seems to be justified, although it has been stated that thousands of video-tape recorder/producers have been marketed. The term *video*, in this instance, is used as the current generic designation for what is also known as closed-circuit television. There is an incursion into the public domain in the domestic recording and reproducing of broadcast material. To what extent this is, in fact, illegal or how the problems of copyright are to be faced is as yet unresolved.

As an encouragement to further usage, and sales, of VTR's, simple lightweight cameras are now available so that the owners can record their own programmes much in the same way as they would use a narrow-gauge motion-picture camera. However, unless a second VTR, with editing facilities, is available the material shot in the camera has to be presented exactly as recorded. The same problem faces the user of an 'instant' motion-picture system (although at present editing and duplicating facilities are not available).

The situation has not been helped by the introduction of further different incompatible styles and types of long-play video-cassette systems. Although the playing times of these newer cassettes have been lengthened, the developments would appear to have a commercial rather than a technical basis. It is understood that, during 1979, vast duplicating facilities have been set up to deal with the expected demand for high-volume cassette production of pre-recorded material. Provision has had to be made for transfers from motion-picture film as well as from master tapes in both 2in and 1in professional formats. In addition, the duplicating establishment must also cater for transfers from one cassette format to another: the permutations and combinations possible are manifold and the investment in capital equipment must, of necessity, be very high. The setting-up of such facilities shows that there is considerable faith in the prospective returns from this branch of the industry. In order to rid ourselves of the stigma of chauvinism, let us turn to a piece of visual sarcasm from the pages of our Swedish contemporary, *Fotonyheterna*.



Appended to the illustration were some comments about the advantages and disadvantages of the various systems, as follows:

**VCR:** (Video Cassette Recording) – about five manufacturers

- + Good picture; good sound; good built-in TC receiver; oldest and most well-proved system
- High tape cost; clumsy cassettes

**SVR** (Super Video Recording) – one manufacturer

- + Good picture; good sound; longest playing time
- Drum poorly protected against dust.

**BETAMAX** – about nine manufacturers

- + Good picture; low tape cost; handy cassettes.
- Poor sound; clumsy format

**VHS** (Video Home System) – about 14 manufacturers

- + Low tape cost; handy format; now the commonest system.
- Requires good antenna for perfect picture; poor sound

There is also still one unresolved problem lurking in the background and that is the matter of infringement of copyright. Worst still is the 'pirate' duplication of recorded material – several cases of this kind were recorded in the technical press during 1979. Our Spanish contemporary *Medios Audiovisuales* drew attention to pirating on a cover of that magazine and devoted no less than 10 pages to the subject. There are extensive references to copyright law.

Continued interest in the 'audiovisual' field (in a rather more limited application of the term) is indicated by the number of companies which have either been re-named or have added audiovisual to their titles. The word may be as printed here, split into two or abbreviated simply as A V or hyphenated as A-V. The continuing success of the MacLaren publication *Audio Visual* is another clear indication of growth in the associated industries which it serves.

On the practical side, multivision may mean a multiplicity of images on a single screen or a close group of screens with discrete or combined images or it may be used to define combined presentations of still and motion-picture images. Attempts to provide acceptable definitions have so far failed, especially as far as Europe and USA are concerned. Multimedia probably gives as clear an indication as any of the use of different constituent parts used in a presentation. The development of large-scale displays has led to some of the few technical improvements to still projection equipment. To meet the need for increased light-output several manufacturers have introduced projectors (usually for the 2 × 2 format, but not limited to that) having either enclosed arc or high-powered tungsten-halogen light-sources. The lamphouses and cooling-systems usually dwarf the projection unit itself – generally a Kodak Carousel, which has aptly been dubbed the work-horse of this industry.

The production of programmes has been facilitated by more and more sophisticated encoding and decoding apparatus. In most cases these rely upon magnetic-tape or -disc recording and reproduction, incorporate memory stores and the means for transferring the completed pulsed programme on to a single multi-track tape for replay. One system provides the user with a visual display on a monitor (not unlike a computer desk-unit) that shows the progress of the making of a programme. It has the advantage that errors are shown up so that corrections can be made. Nevertheless, the designer must still have a very clear idea of what he intends to screen and work-sheets (often with thumbnail sketches as a visual reminder) are still in common use. Electronic equipment, however advanced, cannot supplant the creative work of the programme maker; it can, though, materially relieve him (or her) of some of the drudgery.

Apart from some of the more elaborate public relations and exhibition displays with which only specialists and selected audiences are concerned, the general public has been entertained for some time now in the centre of London with a presentation entitled 'The London Experience'. This is a multi-media display lasting about an hour, utilising a large number of still projectors as well as a motion-picture projector, controlled from a single

1 in 8-track magnetic-tape recording. The track also controls many other 'effects' (including synthetic fog) within the auditorium from the start to the finish of the show. It still does not seem generally to be realised that programme tracks have much more extensive uses than the control of a few projectors with accompanying sound. In Europe, for instance, the whole of the lighting effects, changes in decor and so on (with soft background music) in some restaurants are wholly controlled by pre-programmed magnetic-tape recordings.

Improvements continue to be made in raw stocks, in their processing and so on. These technical details are regularly recorded in the pages of *The British Journal of Photography*, as are those relating to similar improvements in the precise recording of images and their presentation, however, what are often called 'the mechanics of the illusion' are of less importance (although still essential in quality) than the creative side of any enterprise.

# COLOUR PHOTOGRAPHY

The overall trend continued through 1979 of colour materials falling into line with the Kodak-inspired processing methods of C-41 for colour negative films, E-6 for colour reversal films and Ektaprint 2 for colour print papers.

The most important change-over was seen when Agfa-Gevaert introduced their ASA400 CNS film which is compatible for processing with other C-41 type materials. A particular feature of the film is a normal contrast level (gamma 0.7 as compared with 0.65 for the normal-speed material). Other ASA400 films have higher contrasts. The Agfa 400 utilises the positional reversal of the slower red and green layers also found in Kodacolor 400 but in addition has the red mask between the lower two main layers which characterised the Agfa Pocket Special film introduced previously. The purpose, it will be remembered, is to compensate for yellow and magenta.

It should be noted that although processing of C-41 films is compatible, printing characteristics vary, which has relevance to the photo finishing industry.

The new Agfachrome PE reversal paper is for Process 61, which is compatible with the Kodak R-14. The latest Agfacolor negative-positive printing paper, type 5, which is being introduced, is stated to be compatible with Kodak-type developers. (Initial information from the makers, that the two lower sensitised layers would contain couplers immobilised hydrophobically, and the upper hydrophilically, according to the long-chain hydrocarbon principle, have been countermanded, in the interests of mutual compatibility.)

The Ektaprint 2 processing system, which omits the final stabilisation step, is growing in popularity despite initial local resistance due to the custom of washing with unheated water. (Two-bath processing requires heated washing water).

The Ferrania factory, owned by 3Ms, has benefited from considerable research investment and the first improved product is a professional high-speed colour printing paper claimed to have purer whites, better colour saturation and higher resolution, the latter quality resulting from updated coating techniques.

The general trend towards processing compatibility of colour materials from the major firms can confidently be expected to continue.

Kodak introduced an improved version of their ASA400 colour negative film, first in 110 and later in 35mm, with the promise of 120 to follow. Claimed improvements include purer reds, yellows and blues with slightly finer grain, higher sharpness and greater latitude to underexposure. The differences between new and old materials are not dramatic but are perceptible.

The fight between instant print materials continued. Following the

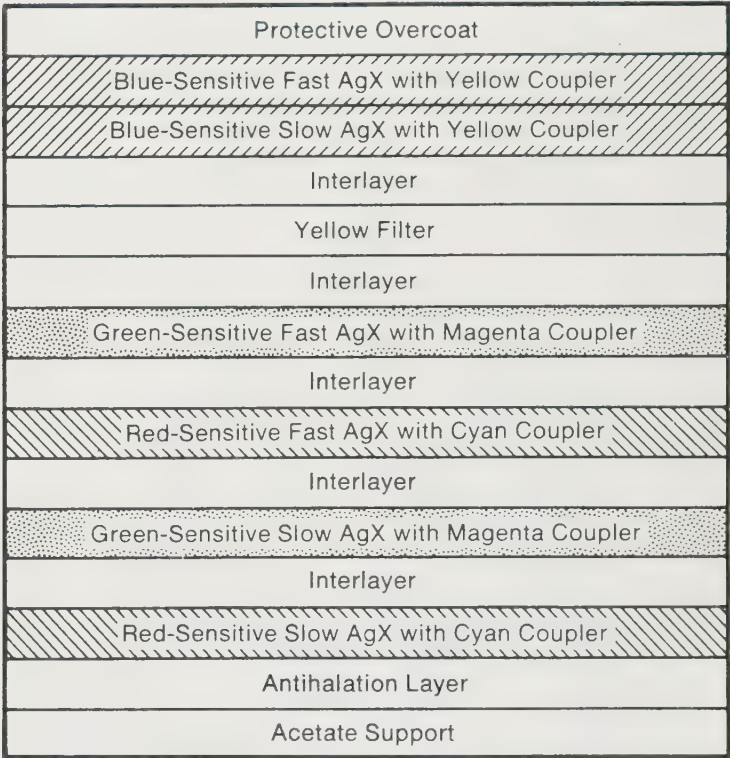
An excellent programme may be spoiled by bad presentation, but a poor programme can be helped very little by the most ingenious of devices

An impression of the increasing importance being attached to the making of audiovisual displays was gained from a survey of the number of production companies which participated in the *Audio Visual 79* Exhibition early in 1979, alongside the manufacturers and distributors of the equipment which they would use in their work. On previous occasions at that exhibition, and at others on the European continent and in the USA, it had always seemed that the dominant note was mainly equipment and not the services. A comparison might be drawn with an imaginary exhibition in which makers of printing presses showed their machinery in conjunction with publishers of books and journals printed upon them. Neither can exist without the other but it is the end product which is still paramount

Stanley W. Bowler

improved Polaroid Instant Film, Kodak produced an improved version of their PR10 Instant Film which processes in about half the time of the old type. The blues and greens are said to show better saturation and the entire picture to display enhanced contrast. Sharpness has been improved due to thinner layers which were in turn made possible by smaller silver halide crystals which could be packed more compactly into the emulsion layers

## Kodacolor 400 Film



Other changes in products included the replacement of Ektacolor slide film 5028 (used for making slides from colour negatives) by Vericolor slide film 5072 (both materials for modified C41 processing). Similarly, Ektacolor Internegative film 6008 was replaced by Vericolor Internegative film 6011, or in sheet film 4112. The new Ektacolor 78 colour paper for printing from negatives is a development of the previous high speed 74 material with higher contrast and maximum density

Neville Maude

# AERIAL PHOTOGRAPHY

Neville Maude

The wheeling flight of hawk or kite  
Observes the land below  
So clear and bright, to avian sight  
Doth every detail show  
That earth bound man with envy can  
Regard the birds on high  
And hope one day to find a way  
To let a human fly – and then the earth espy

Throughout recorded history the bird's-eye view has been envied. There is an old Chinese proverb: 'To see a valley, climb a hill. To see a hill, climb a mountain. To see a mountain become a bird'. Almost as soon as cameras were invented there were attempts to use them from balloons. Nor is that desire dead even today, for there are still enthusiasts who enjoy lifting cameras with meteorological balloons and studying the resultant photographs.

France was particularly active in early balloon photography. Napoleon used observers in balloons for military survey and found they assisted his favourite tactic of throwing his main force against the weakest part of the



enemy's line at a decisive moment. Had reconnaissance balloons been used at Waterloo that battle would probably have ended very differently but it was a year after Waterloo that Niépce began experimenting with lithography, a trail leading later to his well-known first permanent photograph, on bitumen of Judea, in 1822.

A satire published by Andraud, *Une dernière annexe au Palais d'Industrie* in 1855 mentions bird's-eye photographs from a captive balloon but only in a manner which today would be called science-fiction. Credit for taking the first photographs from a captive balloon is usually given to Gaspard Felix Tournachon, known as Nadar, who planned to produce a map by photography from a height of several hundred metres. The process did not work too well – possibly because hydrogen sulphide, in the hydrogen providing the lift, spoilt his collodion plates. However, he did get a recognisable picture of the village of Petit Bicêtre. Honoré Daumier drew the famous cartoon in 1862 and this was printed in *Paris Photographs* (published by his son).

The first really successful photographs from a captive balloon were taken by King and Black who recorded Boston from 1200ft in 1860. In 1863 Negretti photographed a London suburb and subsequently many others followed suite. Nadar had been requested in 1859 to utilise balloon photography in the France-Italian war but either did not approve of Napoleon III or thought his results unlikely to be acceptable. However, in the American Civil War, General McClellan employed balloonists La Montain and Allon in 1861, while in 1862 the Union Army used balloon photographs during the siege of Richmond, Virginia.

Wet collodion was rather slow for use in balloons though in 1868 Nadar did produce an excellent picture of the Arc de Triomphe with this process. With gelatine dry plates the process became easier. It is recorded that Triboulet made the first trials over Paris in 1879. Unfortunately the officials at the octroi office (tollgate) opened the plateholders to inspect the contents! In 1877 W. Woodbury proposed a camera with an electrically-activated shutter controlled by long guide wires from the ground. Four plates were carried on a disc which revolved for consecutive exposures. Baden-Powell supported the idea but apparently there was no practical utilisation of Woodbury's device.

A famous British balloon photographer was Cecil V. Shadbolt who made many ascents in 1883 and 1884 with his balloon *Monarch*, using gelatine plates. In *The British Journal Photographic Almanac and Photographer's Daily Companion*, as the *Annual* was then known, he describes his requisites as being a 7½ x 5in camera with slides, shutters, lenses, an anaeroid barometer registering up to 15 000ft, a pocket compass, maps and a small edition of Murray's *Threepenny Timetables* for transport after landing.

A famous case is that of S.A. Andrée's balloon expedition to the North Pole in 1897, in which all passengers were killed. The films (Kodak rolls) had been buried under ice and snow for 33 years before they were discovered, yet usable negatives were produced – an excellent illustration of cold storage preventing latent-image regression!

In Moscow Thiele utilised a seven-camera combination for panoramic balloon photography while in Germany Muller and Klein used a down-tilted lens which revolved in a circle for the same purpose. Kites were tried for aerial photography by A. Batut in 1887 and Thiele carried on his work. Rocket photography was tried by the German Alfred Maul in 1903 – rather earlier than most people envisage.





*A view of London taken by Brewer from a balloon in 1900*

invaluable in discovering hidden gun emplacements and the like

The start of the 1914 war showed great weaknesses in the state of the art of aerial photography. Plates could not be changed by hand swiftly enough in relatively quick-moving aircraft. Too much vibration was transmitted to the camera mounts and various improvisations, such as sponge rubber and tennis balls, were used.

In war conditions balloons proved unsatisfactory. The hydrogen (unlike the helium available in the USA) ignited easily with incendiary bullets, while captive balloons gave a view only 'over one hill' while moving ones were apt to descend in enemy territory. Wars always accelerate technical developments and though Great Britain entered the war without specialised equipment, progress was rapid. Chemicals such as developing agents and sensitising dyes formerly obtainable only from Germany were synthesized. Special lenses were designed, particularly long-focus types capable of producing sufficient detail from 12 000ft on 7 × 9in negatives. Sizes and weight became problems and two-seater aircraft were required so that the pilot could concentrate on keeping the aircraft level — and look out for enemy planes. By 1916 aerial photography and interpretation of results had grown relatively sophisticated and there are many stories of the discovery of gun sites etc by aerial reconnaissance. As the armies bogged down into static trenches 'relage' or gun aiming was often done by aerial photography. A picture was taken before firing, and again after a few rounds.

After comparing photos the aim would be corrected, more rounds fired, and so on

Both sides resorted to camouflage in order to deceive the photographers and, as an example, in 1918 the US Expeditionary Force used 4 328 000 sq yds of burlap, 2 160 000 sq yds of chicken wire, 200 000 gallons of paint, 7700 fish nets and 50 000 pounds of wire. America entered the war in 1917 and was, inevitably, behind the latest European developments in aerial photography. However, when the war ended in 1918 their Air Service had grown from the original few pilots and less than 250 aircraft to 200 000 men and several thousand planes

The growth in the UK is best described in the following quotation from the *British Journal of Photography*, 2 May 1919

### Army Photography

From a White Paper recently issued by the Air Ministry we learn that photographic reconnaissance in 1914 was confined to two officers and three other ranks, whose outfit consisted of two cameras and a portable box of developing chemicals, while by the end of 1918 the personnel had increased to 250 officers and 3000 other ranks. The increase in equipment and materials to the same date is not stated, but is probably quite proportionate. There must be a vast stock of apparatus and materials which on the final cessation of hostilities will not be required, and we trust that it will be made available for civilian use before it has hopelessly deteriorated. There has necessarily been much waste through imperfect storage during the war, but much of the material should be in good condition. As regards apparatus, the special cameras used will not be of much value to outsiders, but dealers and photographers would be glad to get hold of some of the lenses to tide over until our optical factories are in full swing again. There is another question to be considered—the disposal of the 3000 more or less trained men. Many were photographers before the war, but a very large number will doubtless desire to take up photography in civil life. The openings in this direction have been greatly reduced by the large influx of women as operators, printers, and retouchers, and in the absence of any organisation, there is grave danger of wages sinking to the pre-war level, a prospect which is not pleasing. The remedy would seem to be, for the employers to insist on some standard of proficiency, and to pay a rate of wages commensurate with that ruling for skilled workers in other trades.

During the war Eastman Kodak had worked with cameras and provided photographic training. The British-born Dr Kenneth Mees had developed a panchromatic film and done important work in producing roll film for aerial cameras. The standard K1 camera, with a 20in lens, used a roll of film taking 75 exposures. There was also the Bagley camera (developed by the



*Dirigible over Bayswater, 1929. Courtesy Aerofilms*

Engineers, who did not bother to tell the Air Corps about it) which simultaneously took a vertical picture with left and right obliques. There were already instruments made for rectifying the obliques to give undistorted results and the Air Corps found itself with all the equipment and people for map-making photography.

A similar position occurred in the UK. British lens firms had made remarkable strides and the firms of Aldis, Ross and Taylor, Taylor and Hobson not only claimed their products to be superior to those of Zeiss but were quite willing to produce the proof, as articles in the *British Journal of Photography* showed.

In 1919 the British firm of Aerofilms Ltd was launched. F. L. Wills, who served with the Royal Naval Air Service during the 1914/1918 war was not keen to return to his prewar occupation as an architect. Another flyer, Claude Grahame White became chairman of the new company and Wills became its Managing Director. They hired C. Friese-Greene (son of the famous William) as a staff photographer and were ready, in the words of Wills, 'to do anything and anybody from the air'.

Their main camera was a hand-held wooden one known as the P type Aero Plate camera, made by R. W. Munro of London. This had a 5 x 4in format, a focal plane shutter and fixed cones for 8½in or 10½in lenses. The plates used were Ilford Special Rapid Pan developed in pyro-soda. Some tasks, such as producing cine sequences for the weekly silent cine serials, proved not to be profitable but by 1921 the Metropolitan police required the first aerial traffic survey and the Ministry of Transport asked, for the first time, for a photographic aerial survey. The next stage was to bring in Sir Alan Cobham of the famous flying circus. His personality and fame brought in much useful business, the idea being to stay about two weeks in a town, taking orders for air pictures in the locality, sending the plates back for processing. The procedure worked well and by 1924 the company headquarters were in impressive premises in the Edgware Rd, called inevitably Aerial House. Next came a move into the first real factory at Colindale.

There were, of course, problems from time to time. Aerofilms were accused of aiding cat burglars by their photographs showing roof-tops and a rifle bullet went through a propellor, probably being fired by an angry householder who believed his security was threatened. On one occasion over-enthusiastic pilots were threatened by the Official Secrets Act. Also, there were the flying accidents, or near-accidents, which were inevitable considering the state of technology, at the time. Yet, in general all went well, though the clouds of another war were beginning to gather. Ironically, it was in early 1939 that Aerofilms purchased a Wild A5 continental plotting instrument of unprecedented versatility and quality for the time. However, the RAF were able to put it to good use when hostilities began.

The main camera used by the RAF was the Williamson F24. This took 5½ x 5½in pictures with an electrically operated gearbox and a magazine holding enough film for 100 photographs. A virtue was the rugged construction. Film used at that time was HP3 developed in either D76 or a pyro-metol stain developer. A little infrared monochrome film was used for camouflage spotting. The first aerial colour photographs taken by the RAF, at this time, were on Dufaycolor. At the outbreak of war the RAF were using 5in and 6in lenses.

For the past few years interesting developments had been occurring in the USA, mainly due to George Goddard (who came from Tunbridge Wells). Aerial photography by flash was tried in 1925, when some people in Rochester, New York, were convinced that the Day of Judgment had arrived when a bright flash lit up the city at night. The first trial used a wooden glider filled with 40lb of flash powder and towed behind the aircraft. This was rather expensive since one needed a new glider each time. Also, on one occasion the windlass jammed so they found themselves with a 40lb bomb 15ft away from the aircraft and winding itself closer while the aviators tried desperately to cut or break the rope. Eventually the synchronisation problem was solved with a photocell, which, via a relay,



*Aerofilms make one of their first sorties in a DH9. In front cockpit, F. L. Wills, founder director; centre pilot Gerry Shaw; rear C. Friese-Greene*

opened the shutter.

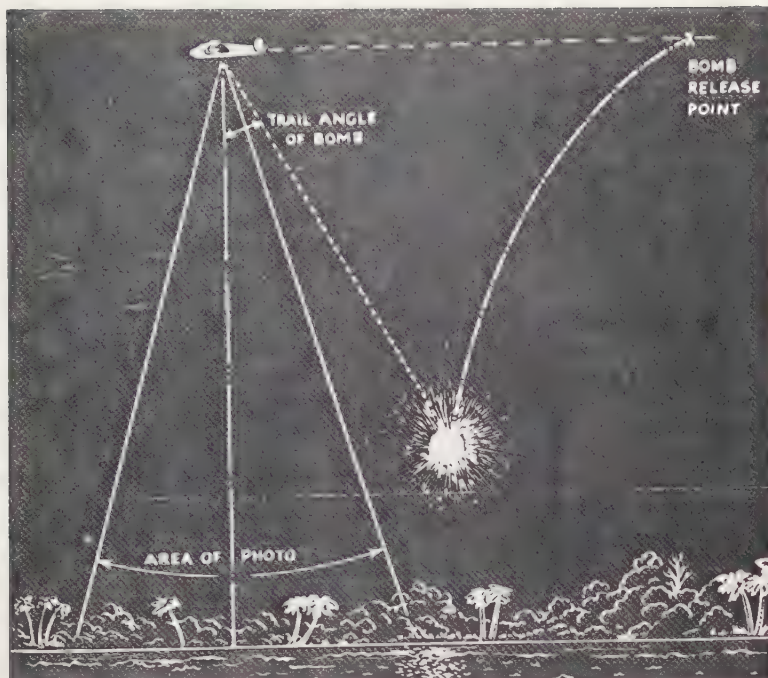
In 1935 Kodak produced Kodachrome but was not very interested in making it in the 9in-wide rolls required for American aerial cameras. Also, the film had to be processed at the Kodak plant, which did not please the military. The Hessler system, developed for Hollywood, was tried but although the film had a higher speed, three negatives were needed and a very complex processing system using special dyes. Later Eastman developed Kodacolor Aero Reversal film and this had evolved to a practical technique by 1939.

Another development, instigated by Goddard, was the shutterless camera, which depended on the film being moved at the same speed as the aircraft flew (relative to the ground). Later this idea was to become a most useful one.

In Germany Hitler was building an air force but in line with previous ideas development was based on hand-held hand-operated oblique cameras. It was not until 1944 that the Germans modernised, which was somewhat too late.

In 1942 Steventon was in a Spitfire on his way to photograph Swinemunde when he noticed construction work on the island near Peenemunde. This was found to relate to the V2 rockets and the fight was on to knock out launching sites as fast as they could be built. Many are the anecdotes which could be told about the feats of various producers of aerial photographs. One person in particular was Sidney Cotton, an Australian, who had mounted in his plane one vertical and two oblique cameras to produce a trimetragon series of photographs with 60% overlap for stereo work. So audacious was Cotton that he even took German officers on flights above the Ruhr valley in the Spring of 1939, taking without their knowledge, pictures showing the build-up of military forces contrary to the Treaty of Versailles.

In July 1941 the new high-speed twin-engined Mosquito entered the reconnaissance service together with the F52 camera using a 36in lens. A lesson had been learnt – high altitude photography was far safer. An



*A diagram of the flash-bomb technique used to take the first night photographs. The system provided a huge burst of light dropped by a bomb behind the area to be photographed. Diagram courtesy of US Air Force.*



*An aerial view of Bremen, taken on a Rolleiflex twin-lens.*

incidental development were the various navigational aids called 'Gee', H2S and Oboe, needed because there was little point in dropping bombs and photographing the results if you did not know where you were.

When America came into the war they sent officers to England to ascertain the state of photoreconnaissance and interpretation; these returned with the information that the USA had lagged behind in many respects. (The army still had kite balloon squadrons, for example.) However, with their research budget multiplied by five, progress was rapid.

Goddard was having trouble in getting his shutterless camera accepted by the establishment and finally, to break the deadlock, had details put in *Life* magazine. After inevitable rows the US Navy ordered a hundred, built by The Chicago Aerial Survey Company.

The RAF altered some F52 cameras to have the moving film feature, which was especially valuable for low-level high-speed reconnaissance. Introduction of the jet-powered Me 262 aircraft forced reconnaissance pilots to fly higher for most photographic work. By early 1944 there were cameras with 60in lenses and later 100in and even a 240in lens. Another interesting development was electronic flash for night photography.

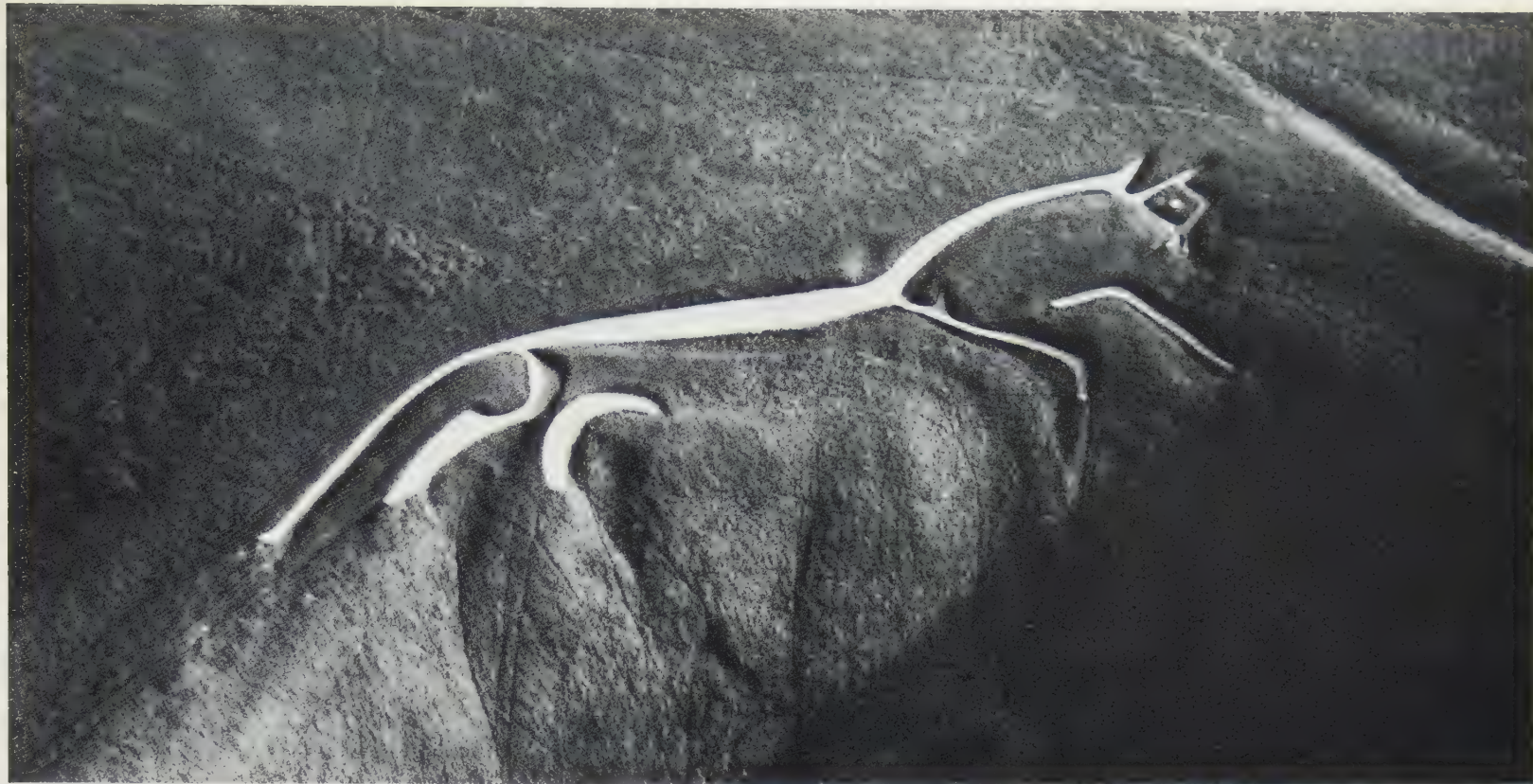
With the cessation of the war in Europe emphasis moved to the Pacific, an American-dominated locality. Initially there was insufficient photoreconnaissance back-up for the B29 Superfortresses but soon F13 planes were developed for photography at altitudes such as 32 000ft. Also, the low-altitude strip camera, mounted in the F6F-5P aircraft, was used extensively in the Okinawa invasion for determining water depths on the landing beaches. Then the atom bomb ended that war.

Photographic work continued in the UK, especially for those engaged on National Service. Not a great deal changed, especially the processing and printing side. The original film-developing equipment was known as the 'tramdriver's special' from the two handles. The film was simply wound, by hand, from one spool to another while immersed in the developer. When the end was reached, the film was wound back (assuming that the person winding was not so overcome by enthusiasm that the handle was employed with such force as to pull the end of the film off the first spool). Of course, later continuous processors of the roller type came into use.

Printing was mainly by contact, especially from the larger negatives, about  $9\frac{1}{2} \times 19$ in. The usual contact printer was a simple glass-topped box with five bulbs below, a sheet of plain glass a few inches above, and above that again the plate glass platen. A lid held paper and negative firmly in contact. Shading could be achieved in a primitive way by removal of bulbs or more subtly by the use of toilet tissue on the intermediate glass. This was particularly useful when the same fault, such as the uneven density caused by an accelerating focal plane shutter, occurred on a whole run of negatives.

It is interesting to compare this simple but effective printer with the elaborate American version which had a complete mosaic of bulbs, each controlled by an individual switch. As an added complication there were uv lamps intended to produce a softer contrast. A drawback was that if someone left the uv lamps on when opening the front of the printer, the invisible radiations were quite capable of fogging every piece of exposed paper in the darkroom, to the considerable annoyance of other workers.

When large numbers of prints were required, without sophisticated shading, the multiprinter was used. This could be considered a primitive ancestor of modern D and P machines as negatives were exposed by means of a photocell and the paper that went in a sinusoidal path through the machine, with duration in the baths controlled by pulling dip rods up or down. Finally, the prints were dried on heated rollers – with audible hissings giving the machine its colloquial name of the 'fish fryer'. Speed of operation was governed by the speed with which the primary operator could adjust exposure levels, if required, and check the negative position in the frame. About one frame per second was a fair average; easy enough when making two prints per frame but harder when producing single prints from each negative.



*Probably the oldest white horse on the chalk downs, Uffington, Berkshire. Courtesy Aerofilms*

Trimming etc was done subsequently by hand. As in ancient Greece, ample 'slave' labour militated against the use of expensive or complex equipment. The old Merrett trimmer was usually employed and it is worth noting that despite the vast numbers of prints chopped up by unskilled persons, and the absence of plastic guards, there was not a single case of an amputated finger tip.

For map-making purposes dimensionally stable paper was needed. The waterproof base used was the forerunner of the present polyethylene-coated materials but it is worth noting that in those days if insufficient hardener was used in the fixer the emulsion would be so tender that corners of one print would gouge into the surface of another. Conversely, if too much hardener was used the emulsion curled away from the base. There was also aluminium-based printing material – not the easiest to trim!

One of the more demanding tasks of the RAF photographic unit was the making of mosaics. At first sight this would appear simple but when the pilot had taken evasive action to avoid flak or an enemy fighter it became a work of art to rectify the adjacent prints to produce a reasonably distortion-free integrated whole. Prints were cut obliquely to give imperceptible joins; in addition the cuts would be made, where practical, along natural lines in the subject. When the usual problems of compensating for cloud shadows were added to those of rectification and matching, plus the need to obtain detail everywhere in the print (even in sunlit snow areas) it will be realised that considerable expertise was required.

The interpreters were also skilled and, for example, on examining a set of tyre tracks in a muddy field could draw remarkably well-informed conclusions about the vehicle, weight of load, direction of travel, speed when the marks were made and other factors.

Postwar the same fast pan films were used in aerial versions, the apparent difference being the capability of producing a higher density in the highlights, which suited the large negative size. D19 was a favourite developer, being clean-working with suitable contrast

Much more could be said about the state of the art at this time but meanwhile progress had shifted to the American sphere.

With the changes in strategy caused by the availability of the H-bomb, the need for reconnaissance before using such weapons became paramount (after all photos could only confirm destruction of target areas). Surprisingly, unmanned balloons made a come-back. There is an air stream in the stratosphere which circles the world, blowing from west to east at fairly constant altitudes at speeds around 200mph. The Soviets complained when they were able to shoot down some of the balloons which traversed the interior of Russia, taking seven to ten days, and then parachuted their exposed film down into friendly territory.

Then came the U2 incident when Gary Powers was forced down and much publicity was given to the continuous strip camera previously mentioned, which was now greatly improved, with many refinements. This type of camera was instrumental in the discovery of the installation of ballistic missiles in Cuba and the confrontation by President John F. Kennedy. The Voodoo supersonic photo-reconnaissance aircraft shot over the island, just above the level of the palm-trees, photographing 12-mile stretches in 51sec. On this mission they used the KA-53 camera with a 12in lens and a minimum exposure time of 1/3000sec. An interesting feature was a bundle of glass fibres carrying information from a panel in the cockpit to the film, so that on each negative the aircrafts' altitude, longitude and latitude were recorded.

Recent strip and panoramic cameras take 12 exposures 12 × 5in, per second. This requires the film to move at a rate of 21ft/sec with the exposure made by a rotating prism synchronised with the moving film to give an effective exposure time of about 1/10 000sec. Such cameras are coupled with an astro-inertial navigation system which relates to the earth moon, stars etc continuously.

Returning to the domestic UK scene, Aerofilms had emerged again as part of the Hunting group of companies. When the ban on private flying



*Gravelly Hill Interchange, alias Spaghetti Junction* Courtesy Aerofilms

was lifted they naturally used F24 cameras which were ideal. Inevitably these had to be phased out as supplies of spare parts ran out and now Hassleblads are used. At present we are informed Agfa 80S is the favourite film with about 90% of the oblique shots being taken in colour. The continuity of this company, despite two world wars, is of great utility and the library of photographs is of ever-increasing value as a record of urban development etc. We doubt if any other company in the world has files of equivalent value.

The other aspect of Aerofilms, again pioneered by Wills, is the vertical air photography section used for surveying and map-making. The vast strides made in this area of aerial photography parallel those of the military, though perhaps in less dramatic form. The science has evolved its own specialised vocabulary with the main areas of development being categorised as photogrammetric digitising of graphical outputs, analytical or computer controlled stereoplotters, orthophotography and, lastly, automatic image correlation.

These sections really demand an entire book to explain but the essence is that the information required from an aerial photograph can be abstracted, converted into forms compatible with modern information devices and then in turn be linked with other specialised instruments of ever-increasing sophistication. Just one example is the cartographic digitiser which virtually draws a map according to instructions.

Several films have been developed mainly for aerial work. The recently demised high speed Ansco colour film was, by its speed and high contrast, particularly suited for such purposes though not for general photographic work. The 'false-colour' Kodak IR film is an invaluable tool for recording changes in vegetation as well as its original purpose of camouflage-spotting. Some of the new ASA400 colour films with higher than normal contrast will be employed to an increasing extent in the future as their suitability is recognised.

An interesting side-line, which to some people is of primary importance, is the use of aerial photography for archaeological survey. A birds-eye view can, under suitable conditions, reveal invaluable clues concerning buildings and the like which are invisible to surface inspection. Many factors influence optimum visibility. Low, glancing, light reveals surface depressions; the height of vegetation, or even its type, is partially dependent on soil depth, especially in drought conditions. An aerial over-view can sometimes reveal relationships within the environment not initially noticed by inspection at the surface. An example is when an Indian village in South Dakota was photographed from the air and revealed Indian ruins over a pre-Columbian city, with a fortified wall, built by Norse settlers about 130 years before the official 'discovery' of America.

All these various aspects of aerial photography continue to develop, but perhaps the last word must be devoted to the 'ultimate birds' – the earth-circling satellites which are, among other applications, contributing so much to our knowledge of global weather.

In 1960 the first *Tiros* (Television Infrared Observational Satellite) was put in orbit and, for example, in '61 *Tiros III* discovered the great hurricane code-named Esther and so saved lives, and property. In a sense we have left conventional photography, but the televised data still produce a picture though by different means. Of course, there are still satellites designed to use silver-emulsion film which is subsequently recovered. Efforts are being made to record in other regions of the spectrum. Normal IR photography is in the 700 to 900nm range but attempts are being made to record, for example, in the 9000nm range of the human heat radiation, though 'fog' problems are obviously very great.

The original camera is now considered as a remote sensing device responsive to various bands. Recordings in 20 bands over a 10 stage intensity scale can ideally provide  $20^{10}$  or nearly 10 000 million different combinations or distinctive characteristics of terrestrial features. Coverage can be wide. A geosynchronous satellite at a height of nearly 36 000km can cover a third of the globe, though resolution would be confined to about a



*US satellite with a view of the Earth from a higher viewpoint than any bird*

3km square. No longer can there be a Shangri-la! Agriculture is of increasing importance as population grows. Aerial survey permits monitoring of crops, including forestry. A sensor scanning in the near ultraviolet and thermal infrared can detect oil slicks regardless of their age. The original Gemini spacecraft missions took pictures with hand-held cameras and the clarity was excellent due to lack of scattering by the atmosphere. In just one pass the astronauts photographed about 80% of Peru in only three minutes.

Since the sun angle changes during an aircraft flight, aerial mosaics show variations in shadow patterns and texture which complicate their interpretation. In an appropriate sun-synchronous orbit a satellite is capable of recording under conditions which change little, for as the satellite passes overhead it is always the same local time. Among the uses of such surveying is detection of incipient volcanic action by the mapping of thermal gradients. In another instance aerial infrared images taken over the Hawaiian coast showed 250 underground springs discharging cool fresh water into the warmer seas.

The science of oceanography has been greatly extended as pictures from outside the atmosphere show the water currents, hidden shoals and dangerous reefs. The Earth is now well mapped, so is the Moon, much of Mars and even Jupiter has been observed. All this progress has occurred in less than 200 years

## References and acknowledgements

With so extensive and diverse a subject, treatment of some aspects must regrettably tend towards the cursory. Familiar references include *The British Journal of Photography*, both magazine and annual or yearbook. A historical reference especially regarding French participation, is *History of Photography* by J. F. Eder (Dover Publications). An interesting military history, with emphasis on American aspects, is *Aerial Photography* by Grover Heiman in the Air Force Academy Series (Macmillan). A comprehensive textbook is *Geographical Applications of Aerial Photography* by C. P. Lo (David and Charles). Information on Aerial Photography, celebrating their 60th anniversary, can be found in their *Hunting Group Review* No. 68, and there was also an article in the *RPS Journal* for June 1974. Invaluable theoretical information can be found in *Image Evaluation for Aerial Photography* by G. C. Brock (Focal Press). Those wishing to study further should also list other references in the usual expanding circle. Thanks are due to Mr W. H. Brooker and Mr D. F. Smith of Aerofilms for their assistance and to the Science Museum for illustrations



NY 10019, USA. Telephone (area code 716) 271-3361.

*International Center of Photography*, 1130 Fifth Avenue, New York, NY 10028, USA. Telephone: (area code 212) 860-1777, (Permanent home for the 'International Fund for Concerned Photography').  
*Library of Congress*, 10 First Street SE, Washington, DC 20540, USA.

*Museum of Modern Art*, 11 West 53 Street, New York, NY 10019, USA. Telephone: (area code 212) 956-6100.

*Professional Photographers of America Inc*, 1090 Executive Way, Des Plaines, Illinois 60018, USA. Telephone: (area code 312) 299-8161.

*Smithsonian Institution, Hall of Photography*, 1000 Jefferson Drive SW, Washington, DC 20560, USA.

*University of Texas*, Humanities Research Centre, Box 7219, Austin, Texas 78712, USA (includes the Gernsheim Collection).

For further reference see:

*Photography: Source and Resource*, Lewis, McQuaid and Tait, Turnip Press, 1973.

### Other countries

*Auckland Institute and Museum*, The Domain, Auckland 1, New Zealand.

*Australian Centre for Photography*, 76a Paddington Street, Paddington, North Sydney, New South Wales 2060, Australia.

*Bensusan Museum of Photography and Library*, City of Johannesburg Public Library, Market Square, Johannesburg 2001, South Africa. Telephone: 836-3787.

*Pentax Museum*, 3-21-20 Mishiazabu, Mirato-ku, Tokyo 106, Japan.

## DEALERS IN OLD PHOTOGRAPHS AND PHOTOGRAPHICA

The method for buying and selling of old photographs and photographica may be through either a specialist dealer ● or a fine art auctioneer and valuer ■. In addition, some dealers may act as agents for contemporary photographers □.

### United Kingdom

■ *Biddle and Webb*, Icknield Square, Ladywood Middleway, Birmingham. Telephone: 021-455 8150.

■ *Christie's* (Christie, Manson and Woods), 8 King Street, St James's, London SW1Y 6QT. Telephone: 01-839 9060.

■ *Christie's South Kensington*, 58 Old Brompton Road, London SW7 3JS. Telephone: 01 581 2231.

■ *Pand D Colnaghi and Co Ltd*, 14 Old Bond Street, London W1X 4JL. Telephone: 01-491 7408.

● *Ken and Jenny Jacobson Victorian Photography*, Southcotts, Petches Bridge, Great Bardfield, Nr Braintree, Essex CM7 4QN. Telephone: Great Dunmow 81566.

● □ *Marlborough Fine Art (London)*, 6 Albemarle Street, London W1X 3HF. Telephone: 01-629 5161.

■ *Sotheby's Belgravia*, 19 Motcomb Street, London SW1X 8LB. Telephone: 01-235 4311.

● *Vintage Cameras Limited*, 256 Kirkdale, London SE26 4NL. Telephone: 01-778 5416/5841.

### Western Europe

■ *Augsburger Kunst-Auktionshaus Petzold*, Maximilianstrasse 53 und Zeugplatz im Fuggerhaus, D-8900 Augsburg, Federal German Republic. Telephone: 0821-337.25/24.

● □ *Marlborough Galerie AG*, Glärnischstrasse 10, CH-8002, Zürich, , Switzerland. Telephone 01/36.34.90.

### North America

● *Antique Photographica*, 273 Springtown Road, New Paltz, NY 12561, USA. Telephone: (area code 914) 255-7342

● *Classic Photographic Apparatus*, The Craigs, Box 161, Simsbury, Conn 06070, USA. Telephone: (area code 203) 658-5782

● *Daguerrean Era*, Tom and Elinor Burnside, Pawlet, Vermont 05761, USA. Telephone: (area code 802) 325-3360.

● *Howard C. Daitz, Photographica*, Box 530, Old Chelsea Station, New York, NY 10011, USA.

● *Leon Jacobson*, 161 Genesee Park Drive, Syracuse, NY 13224, USA. Telephone: (area code 315) 446-8345.

● □ *Janet Lehr Inc*, 45 East 85 Street, New York, NY 10028, USA.

● *Mostly Kodak*, PO Box 12284, Philadelphia, Pa 19144, USA.

● □ *Veikrug Galleries Inc*, 224 East 68 Street, New York, NY 10021, USA. Telephone: (area code 212) 288-7741.

● *George R. Rinhart*, 920 Park Avenue, New York, NY 10028, USA. Telephone: (area code 212) 628-4180

■ *Sotheby Parke Bernet Inc*, 980 Madison Avenue, New York, NY 10021, USA. Telephone: (area code 212) 472-3400.

● *Swann Galleries Inc*, 104 East 25 Street, New York, NY 10010, USA. Telephone: (area code 212) 254-4710

● *Waterhouse Stop*, Box 472, Athens, Ohio, 45701, USA. Telephone: (area code 614) 592-1789.

## EDUCATION AND TRAINING

### General

Selected reading of HM Government reports, etc, relating to the further education sector of education.

*Art Education*. First Report of the National Advisory Council on Art Education (Chairman: Sir William Coldstream), 1960.

*Committee on Higher Education*. Report of the Committee appointed by the Prime Minister to review the pattern of full-time higher education in Great Britain (Chairman: Lord Robbins), 1961-1963.

*Vocational Courses in Colleges and Schools of Art* Second Report of the National Advisory Council on Art Education (Chairman: Sir William Coldstream), June 1962

*Post-Diploma Studies in Art and Design*. Third Report of the National Advisory Council on Art Education (Chairman: Sir William Coldstream), 1964.

*Plan for Polytechnic and Other Colleges*. Higher Education in the Further Education System, 1966.

*National Film School*. Report of committee to consider the need for a National Film School (Chairman: Lord Lloyd of Hampstead), June 1967.

*The Structure of Art and Design Education in the Further Education Sector*. A report of a Joint Committee of the National Advisory Council on Art Education and the National Council for Diplomas in Art and Design (Chairman: Sir William Coldstream), 1970.

*Teacher Education and Training*. (Chairman: Lord James of Rusholme), 1972.

*Vocational Courses in Art and Design*. Report of the Working Group on Vocational Courses in the Design Technician Area (Chairman: A. S. Gann), 1974

Other publications dealing with education and training include

*Compendium of Graduate Opportunities*. Published by The New Opportunity Press, London

*Degree Courses Guide*. A guide to first degree courses in the UK universities and colleges. Published annually for CRAC by Hobsons Press (Cambridge) Limited

*Directory of Further Education*. Published annually for CRAC by Hobsons Press (Cambridge) Limited

*Directory of Opportunities for Graduates - Employers*. Published annually for CRAC by Haymarket Publishing Limited

*Directory of Opportunities for Graduates - Further Studies*. Published annually for CRAC by Haymarket Publishing Limited.

*The Education Authorities Directory and Annual*. Published by the School Government Publishing Company Limited

*The Educational Committees Yearbook*. Published annually by the Councils and Education Press, London

*Graduate Employment and Training*. Published annually for CRAC by Hobsons Press (Cambridge) Limited.

*Graduate Studies*. A guide to all areas of postgraduate study and research in the UK. Published annually for CRAC by Hobsons Press (Cambridge) Limited

*The Job Book*. A guide to training and career choices for school and college leavers. Published for CRAC by Hobsons Press (Cambridge) Limited.

See also:

*The Directory of Career Publications*. 900 career books described by their publishers, with reviews, editorial comments and career library classifications. Published by the Graduate Press Limited, Wroxtton House, Chorleywood, WD3 5LA.

## COURSES (PHOTOGRAPHY, FILM AND TELEVISION)

### United Kingdom

*SPE Directory of Photographic Courses*, Henry Greenwood and Co Ltd, London 1978. First published as 'Courses in Photography, Film and Television', the seventh survey compiled by the Society for Photographic Education, and published in the *British Journal of Photography*, 16 December, 23 December and 30 December 1977.

*Film and Television Courses in the United Kingdom*, BKSTS Journal, April 1974.

### North America

*Guide to College Courses in Film and Television*, Peterson's Guides, PO Box 2123, Princeton, NJ 08540, USA

*A Guide to Film and Television Courses in Canada*, Canadian Film Institute, 75 Albert Street, Suite 1105, Ottawa, Ontario K1P 5E7, Canada

*A Survey of Motion Picture, Still Photography, and Graphic Arts Instruction*, by Dr C William Horrell. Published by the Eastman Kodak Company, pamphlet No T17

### Open University

*Walton Hall, Milton Keynes*, Buckinghamshire MK6 7AA. Telephone: Milton Keynes 74066

Granted Royal Charter in 1969, the Open University provides programmes of part-time study in the field of higher education. These programmes are aimed at people who for personal reasons would otherwise be

unable to obtain a degree by providing modular courses of study by integrating the use of radio (VHF), television (BBC2), written correspondence material, other audio and visual aids, student counselling and tutorial services at local study centres and residential summer schools. The academic year is from January to October with examinations in November.

For further details write:

The Admissions Office, The Open University, PO Box 48, Milton Keynes, Buckinghamshire MK7 6AB (for undergraduate courses leading to the award of BA, either with or without honours). The Post-Experience Student Office, The Open University, PO Box 76, Milton Keynes, Buckinghamshire MK7 6AN (for post experience courses leading to a course certificate). The Higher Degrees Office, The Open University, PO Box 49, Milton Keynes, Buckinghamshire MK7 6AD (for post-graduate research degrees leading to the award of BPhil, MPhil or PhD, and higher doctorates leading to the awards of DLitt or DSc).

Employers, local authorities and other institutions should direct their enquiries to the Assistant Secretary (Registry), The Open University, PO Box 71, Milton Keynes, Buckinghamshire MK7 6AG. For general availability of correspondence material contact the Director of Marketing, The Open University, PO Box 81, Milton Keynes, Buckinghamshire MK7 6AT.

### **Polytechnics**

The White Paper of May 1966, *A Plan for Polytechnics and Other Colleges* outlined the intention of the Secretary of State to designate a limited number of major centres as the main focus for the development of higher education within the further education system. These centres, called generically 'polytechnics' are envisaged as comprehensive institutions offering full-time, sandwich and part-time courses of higher education with the concentration of resources necessary for the maintenance of high standards. There are thirty polytechnics within the United Kingdom.

Further information regarding courses offered see the *Polytechnic Courses Handbook*, published annually for the Committee of Directors of Polytechnics by Lund Humphries, 12 Bedford Square, London WC1. The Committee of Directors of Polytechnics (CDP), 309 Regent Street, London W1, also publishes *Focus* (quarterly).

## **TRAINING (MANUFACTURERS)**

### **United Kingdom**

*Kodak Limited*, Marketing Education Centre, Gadebridge Lane, Hemel Hempstead, Hertfordshire HP1 3HQ. Telephone: Hemel Hempstead 58661.

### **Western Europe**

*Agfa-Gevaert NV*, Agfacolor School, Septestraat 27, B-2510 Morsel (Antwerpen), Belgium.

*Agfa-Gevaert AG*, Agfa-Gevaert-Technikum, Kistlerhofstrasse 75, 8 München 25, Federal German Republic.

### **North America**

*Eastman Kodak Company*, Marketing Education Center, 343 State Street, Rochester, NY 14650, USA.

## **TRAINING (POST-EXPERIENCE)**

### **United Kingdom**

There are opportunities for the established professional to up-date and increase his knowledge. These take the form of short courses and lecture series organised

within establishments of further education or seminars and conference promoted by the various professional organisations. Details of such activities are published in the press

### **North America**

See the current *Schedule of Instruction*, Winona School of Professional Photography, Winona Lake, Indiana 46590, USA.

## **SPECIALIST EDUCATIONAL AND TRAINING BODIES**

### **Advisory Centre for Education (ACE)**

*32 Trumpington Street, Cambridge, CB2 1QY. Telephone: Cambridge 51456.*

An independent non-profit-making organisation whose aims are to provide information and advice on education to parents, students and others; to press for greater consideration of the consumer's viewpoint in education; and to encourage greater co-operation between the home and school. The Centre publishes *Where*, a monthly magazine on education

### **National Union of Students (NUS)**

*3 Endsleigh Street, London WC1H 0DH. Telephone 01 387 1277*

The NUS acts as a major spokesman of student opinion at both national and college level. Services to students include legal aid, insurance, discounts for goods etc. Publications include *Magnus* (published five times a year) and the *NUS Discount Directory* (published annually).

Endsleigh Insurance (Brokers) Limited are a subsidiary of the NUS with a network of forty-two centres within the UK. Their head office is Endsleigh House, Ambrose Street, Cheltenham Spa, Gloucestershire GL50 3NR. Telephone: Cheltenham 36151.

### **Printing and Publishing Industry Training Board (PPITB)**

*Merit House, Edgware Road, London NW9 5AG. Telephone 01 205 0162*

The PPITB is the Industry Training Board with responsibility for the training of the photographic industry. Full details of its scope are obtainable from the Board. Regional Offices are at the following addresses:

*Scotland:* Merchants House Buildings, 7 West George Street, Glasgow G2 1BA. Telephone: 041-248 5692.

*Northern:* Raines House, Denby Dale Road, Wakefield WF1 1HR. Telephone: Wakefield 77477.

*Central:* Scala House, Holloway Circus, Birmingham B1 1EQ. Telephone: 021-643 1327.

*Wales and West:* Clifton Heights, Triangle West, Bristol BS8 1EJ. Telephone: Bristol 27581.

*London:* Merit House, Edgware Road, London NW9 5AG. Telephone: 01-205 6135.

*Southern:* Merit House, Edgware Road, London NW9 5AG. Telephone: 01-205 6135.

### **Technical Education Council (TEC)**

*76 Portland Place, London W1N 4AA. Telephone. 01-580 3050.*

The TEC, set up in March 1973, is principally concerned with setting standards, awarding qualifications, and promoting advances in technical education. The Council is also engaged in producing a more rational and simplified range of courses leading to the TEC Certificate, Higher Certificate, Diploma and Higher Diploma. TEC is an independent organisation established by the Secretary of State for Education and Science.

In Scotland, technician education comes under the control of the *Scottish Technical Education Council*

(SCOTEC), 38 Queen Street, Glasgow G1 3DY. Telephone: 041-204 2271.

### **Examinations and Qualifications**

#### **City and Guilds of London Institute (CGLI)**

*46 Britannia Street, London WC1X 9RG. Telephone: 01-278 2468*

The CGLI offers two examination schemes in photography aimed at supplementing a person's day-to-day experience in a relevant field of professional photography. These schemes are the 744 General Photography Certificate followed by the General Photography Advanced Certificate and the 745 Scientific and Technical Photography Certificate followed by Scientific and Technical Photography Advanced Certificate

#### **Council for National Academic Awards (CNAAP) – General Information**

*344-354 Gray's Inn Road, London WC1 8BP. Telephone: 01-278 4411*

The CNAAP is an autonomous body established by Royal Charter in 1964. The Council awards degrees and other academic distinctions comparable in standard with awards granted and conferred by universities, to students who satisfactorily complete approved courses of higher education in establishments of higher education which do not have the power to award their own degrees. Courses initially lead to the award of BSc, BA or BEd. The Council also awards MSc and MA degrees and diplomas for the completion of postgraduate courses of study, in addition to the research degrees of MPhil and PhD and higher degrees for published work. For further information on courses that lead to a first degree of the CNAAP, see the CNAAP publication *Compendium of Degree Courses*

#### **Council for National Academic Awards (CNAAP) – Art and Design**

The CNAAP Art and Design panel was formed in 1974 by the amalgamation of the National Council for Diplomas in Art and Design (NCDAD) with the CNAAP. There are five specialist panels which represent the main areas of study: Fine Art, Graphic Design, Three-dimensional Design, Photography and Textiles/Fashion. Frequently courses include a measure of specialisation in a chief study area. Minimum entry requirements to courses leading to the CNAAP BA (Hons) Art and Design degree at 18 years of age are either 5 GCE 'O' levels plus the successful completion of a Foundation Course, or direct entry with 2 GCE 'A' levels. Successful post-graduate study leads to the CNAAP MA Art and Degree award

Entry to both graduate and post-graduate level courses are centralised, and application forms are obtainable from and processed by the Art and Design Admissions Registry (ADAR), Imperial Chambers, 24 Widemarsh Street, Hereford HR4 9EP.

#### **GCE/CSE in Photography**

The use of the photographic medium in both GCE and CSE is limited. The Associated Examining Board for the General Certificate of Education, Wellington House, Aldershot, Hampshire GU11 1BQ, offer examinations at both 'O' and 'A' level. Several CSE boards offer syllabuses covering aspects of photography or film. More frequently, its scope is restricted to part of a physics/general science syllabus or as an option in arts and crafts.

#### **Professional Qualifications**

See also 'Professional Associations and Learned Societies'. Further information is also given in the *SPE Directory of Photographic Courses*, listed under 'Courses (Photography, Film and Television)'.

# GALLERIES AND FINE ART DEALERS

## GALLERIES

Key:

- Photographic Gallery
- △ Gallery that holds exhibitions of a photographic nature at regular intervals.
- Gallery that sells original, contemporary prints.
- Gallery that sells quality reproductions

## United Kingdom

- △ *Albert Street Workshop*, 8 Albert Street, Hebden Bridge, West Yorkshire HX7 8AH. Telephone: Hebden Bridge 3714.
- △ *Arnolfini Gallery*, Narrow Quay, Bristol BS1 4QA. Telephone: Bristol 299191.
- *Asahi Pentax Gallery*, 6 Vigo Street, London W1X 1AH. Telephone: 01-437 7358.
- □ *Creative Camera Gallery*, 19 Doughty Street, London WC1N 2PT. Telephone: 01-405 7562.
- □ *Fotogalerie 48*, 48 Hill Rise, Richmond, Surrey
- □ *Fox Talbot Museum*, Lacock, Wiltshire SN15 2LG. Telephone: Lacock 459. (Open March to October inclusive).
- □ *The Gallery of Photography*, 37-39 Wellington Quay, Dublin 2. Telephone: Dublin 714654.
- △ *Grass Roots Gallery*, 1 Newton Street, Piccadilly, Manchester M1 1HW. Telephone: 061 236 3112.
- ■ □ *Half Moon Gallery*, 119 Roman Road, London E2. Telephone: 01-980 8798.
- □ *Impressions Gallery of Photography*, 17 Colliergate, Market Place, York YO1 2BN. Telephone York 54724.
- *Ikon Gallery*, 58-72 John Bright Street, Birmingham B1 1BN. Telephone: 021-643 0708.
- △ *Institute of Contemporary Arts*, Nash House, 12 Carlton House Terrace, London SW1Y 5AH. Telephone: 01-930 0493.
- *Kodak Photographic Gallery*, 246 High Holborn, London WC1V 7EA. Telephone: 01-405 7841.
- △ *Midland Group Gallery*, 24-32 Carlton Street, Nottingham NG1 1NN. Telephone: Nottingham 582636/7.
- △ *National Portrait Gallery*, 2 St Martin's Place, London WC2. Telephone: 01-930 1552.
- *Night Gallery*, 52 54 Kenway Road, London SW5. (open 6.00pm to midnight).
- *Open Eye Gallery*, 90-92 Whitechapel, Liverpool 1. Telephone: 051-709 9460.
- ■ □ *The Photographers' Gallery*, 8 Great Newport Street, London WC2. Telephone: 01-836 7860.
- ■ □ *The Photographic Gallery*, Association of Photographers in Wales, 41 Charles Street, Cardiff CF1 4EB. Telephone: Cardiff 41667.
- *The Photographic Gallery*, Brewery Arts Centre, 122A Highgate, Kendal, Cumbria LA9 4HE. Telephone: Kendal 25133.
- ■ □ *The Photographic Gallery*, The University, Southampton SO9 5NH. Telephone: Southampton 559122.
- □ *Royal Photographic Society*. (See Societies.)
- △ *Serpentine Gallery*, Kensington Gardens, London W2 3XA. Telephone: 01-402 6075.
- *Side Gallery*, 9 Side, Newcastle upon Tyne NE1 3JE. Telephone: Newcastle upon Tyne 22208.
- △ *Spectro Arts Workshop*, Bells Court, Pilgrim Street, Newcastle upon Tyne NE1 6RH. Telephone: Newcastle upon Tyne 22410.
- △ *Stills*, The Scottish Photography Group Gallery, 58 High Street, Edinburgh. Telephone: 031 558 1140

- ■ □ *Sutcliffe Gallery*, 1 Flowergate, Whitby, Yorkshire. Telephone: Whitby 2239
- △ *Victoria and Albert Museum*, South Kensington, London SW7 2RL. Telephone: 01-589 6371
- *Victoria House Gallery of Photography*, Tayport, Fife DD6 9AR. Telephone: Tayport 5341

See *Arts Review Yearbook and Directory*, published by Richard Gainsborough Periodicals Limited, 8 Wyndham Place, London W1H 2AY; for Art Exhibition Index, London Gallery Directory, London Public Galleries, Specialist Galleries in London, Regional Gallery Guide, etc.

A regular listing of photographic exhibitions is published fortnightly under the rubric 'Current Photographic Exhibitions' in alternate issues of the *British Journal of Photography*

## Western Europe

- *Canon Photo Gallery*, Reestraat 19, Amsterdam, The Netherlands.
- *Central Culturel Américain*, 3 rue de Dragon, 75 Paris 6e, France.
- *Foto et Film Centrum*, Mein 50, B-2000 Antwerpen, Belgium.
- *Fotogalerie der Staatliche Landesbildstelle Hamburg*, Kielerstrasse 171, D-54 Hamburg, Federal German Republic.
- *Fotogalerie die Brücke*, Backerstrasse 5, A-1010 Wien, Austria.
- *Foto Galerie 5.6*, St Michielsplasse 14, B-9000 Ghent, Belgium.
- *Fotogalerie Lichttopfen*, D-51 Aachen, Kockerellstrasse 44, Federal German Republic
- *Fotogalerie Wilde*, Forsterstrasse 27, D-5000 Köln 30, Federal German Republic.
- *Galerie Stieglitz*, Avenue Louise, 90, B-1050 Bruxelles, Belgium.
- ■ *Il Diaframma*, Via Brera 10, Milano, Italy.
- *La Photo Galerie*, 2 rue Christine, Paris 6e, France.
- *Maison Européenne de la Photographie*, 26 quai des Messageries, F-71100 Chalon-sur-Saône, France.
- *Nicéphore*, 8 Rue de la Gare, Bollwiller F-68540, France.
- *Pictures Fotogalerie*, D 1000 Berlin 65, Barfustrasse 10, West Berlin.
- *Spectrum Fotogalerie*, D-3000 Hanover, Karmaschstrasse 44, Federal German Republic.
- ■ *Spectrum-Canon*, Balmes 86, Barcelona 8, Spain

## North America

- ■ *Baldwin Street Gallery of Photography*, 23 Baldwin Street, Toronto 130, Ontario, Canada Telephone: (area code 416) 364-2630.
- ■ *Carl Siembab Gallery of Photography*, 162 Newbury Street, Boston, Massachusetts 02116, USA. Telephone: (area code 617) 262-0146.
- *Exposure Photographic Gallery*, 214 East 10 Street, New York, NY 10003, USA. Telephone: (area code 212) 982 6330.
- ■ *Focus Gallery*, 2146 Union Street, San Francisco, California 94123, USA. Telephone: (area code 415) 921 1565
- *Fotografia Gallery*, 6226 Wilshire Boulevard, Los Angeles, California 90048, USA
- □ *Friends of Photography*, Sunset Centre, PO Box 239, Carmel, California 93921, USA
- *Gallery of Photography*, 453 St Francis-Xavier, Montréal, Québec, Canada

- ■ *International Museum of Photography*, George Eastman House, 900 East Avenue, Rochester NY 14607, USA. Telephone (area code 716) 271-3361
- *Kodak Photographic Gallery*, 1133 Avenue of the Americas, New York, NY 10019, USA
- *Light Impressions Gallery*, 8 South Washington Street, Rochester, NY 14614, USA
- ■ *Light Gallery*, 724 Fifth Avenue, New York, NY 10019, USA. Telephone: (area code 212) 582-6552
- *Mind's Eye Photographic Gallery and Bookstore*, 52 Water Street, Vancouver 4, BC, Canada. Telephone: 685-4927
- ■ *Museum of Modern Art*, 11 West 53 Street, New York, NY 10019, USA. Telephone: (area code 212) 956-6100
- *Ohio Silver Gallery*, 11554 Ohio Avenue, Los Angeles, California 90025, USA
- *Panopticon Gallery of Photography*, 187 Bay State Road, Boston, Massachusetts 02215, USA
- *Quivira Photograph Gallery*, 111 CorneW Drive SE, Albuquerque, New Mexico 87106, USA Telephone: (area code 505) 266-1788
- *Soho Photo Gallery*, 30 West 13 Street, New York, NY 10011, USA

## Other countries

- *Australian Centre for Photography*, 76a Paddington Street, NSW, Australia
- *Brummels Gallery of Photography*, 95 Toorak Road, South Yarra, Australia
- *Kodak Gallery*, 252 Collins Street, Melbourne, Australia.
- *Nikon Salon*, 5-63-chome, Ginza, Chuo-ku, Tokyo, Japan.
- *Pentax Gallery*, 3-21-20 Mishiazabu, Minato-ku, Tokyo 106, Japan.
- *Snaps Gallery*, 30 Airedale Street, Auckland 1, New Zealand.

## FINE ART DEALERS

There is a growing market for original photographic prints, limited edition folios and high quality facsimiles. This is reflected by the increasing number of fine art dealers involved with the photographic medium. The following listings cover: ● – specialist dealer in photographic prints, △ – specialist publisher of photographic prints, ■ – dealer or publisher produces an illustrated catalogue: □ – a company that produces products for storage of photographs to levels of archival permanence.

## United Kingdom

- *Marlborough Fine Art (London) Limited*, 6 Albemarle Street, London W1X 3HF.
- *New Grafton Gallery*, 42 Old Bond Street, London W1X 3AF.
- *Robert Self Limited*, Gallery and Bookshop, 9 Cork Street, London W1. Telephone: 01-437 5836

## Western Europe

- △ ■ *Galerie Fiolet BV*, Herengracht 86, Amsterdam Holland. Telephone: 020-23 06 05
- *Marlborough Galerie AG*, Glarischstrasse 10 CH-8002 Zurich, Switzerland

## North America

- *Artcase*, Box 128, Frenchtown, New Jersey 08825, USA

- ▲ ■ *Corcoran Gallery of Art*, 17 and NY Avenue, Washington DC 20006, USA
- △ *Handbook Company*, Box 491, Athens, Ohio 45701, USA.
- *Len Harnett Archival Products*, 300 North Quidnessett Road, North Kingstown, RI 02852, USA. Telephone: (area code 401) 884-1480
- ▲ ■ *Kimmel/Cohn*, 41 Central Park West, New York, NY 10023, USA.
- ■ *Janet Lehr Inc.*, 45 East 85 Street, New York, NY 10028, USA.
- *Light Impressions Corporation*, Box 3012, Rochester, NY 14614, USA.
- ▲ ■ *Photopia*, 1728 Spruce Street, Philadelphia, Pa 19103, USA.
- △ *Vision*, 216 Newbury Street, Boston, Mass 02167, USA. Telephone: (area code 617) 266-9481.
- ■ *Witkin Gallery*, 41 East 57 Street, New York, NY 10022, USA. Telephone: (area code 212) 355-1461

## PROFESSIONAL ASSOCIATIONS AND LEARNED SOCIETIES

### GENERAL

This encompasses associations, institutes and organisations. The following directories offer comprehensive listings:

*Directory of British Associations, and Associations in Ireland*. CDB Research Publication, 4th Edition, 1974-75.

*Directory of European Associations – Part 1: National Industrial, Trade and Professional Organisations*. CDB Research Publication, 2nd Edition, 1975-76.

*Directory of European Associations – Part 2: National Learned, Scientific and Technical Societies*. CDB Research Publication, 1st Edition, 1974.

### EDUCATION

This includes professional associations, institutes and unions of specific interest to teachers and lecturers.

#### United Kingdom

*Council for Photography* (formerly *Society for Photographic Education*), c/o Dr Philip Stokes, Department of Visual Communication, Trent Polytechnic, Dryden Street, Nottingham. Telephone: Nottingham 48248.

*National Association of Teachers in Further and Higher Education (NATFHE)*, Hamilton House, Mabledon Place, London WC1H 9BH. Telephone: 01-387 6806.

*National Society for Art Education (NSAE)*, 37a East Street, Havant, Hampshire. Telephone: Havant 4477

*National Union of Teachers (NUT)*, Hamilton House, Mabledon Place, London WC1H 9BH. Telephone: 01-387 2442.

#### North America

*National Art Education Association*, 1916 Association Drive, Reston, Virginia 22091, USA.

*National Association of Schools of Art*, 11250 Roger Bacon Drive, Suite 5, Reston, Virginia 22090, USA.

*Society for Photographic Education (SPE/USA)*, PO Box 1651, FDR Post Office, New York, NY 10022, USA.

### PHOTOGRAPHY

This includes professional associations, institutes, learned societies and trade unions which have a direct relevance to the photographic profession. The entries are by necessity selective, covering photography and closely allied fields. Where no address is given the

organisation is the subject of a separate main entry in the following section

#### United Kingdom

*Advertising Association*, Abford House, 15 Wilton Road, London SW1V 1NJ. Telephone: 01-730 5221

*Advertising Standards Authority Limited*, 15-17 Ridgmount Street, London WC1E 7AW. Telephone 01-580 0801

*Artlaw*, 358 Strand, London WC2. Telephone: 01-240 0610. (Provides a national legal service for the arts community)

*Art Galleries Association*, c/o Secretary, Graves Art Gallery, Surrey Street, Sheffield 1. (To further the public exhibition, presentation and interpretation of art, and the interests of those professionally engaged in this work)

*Association of British Manufacturers of Photographic Cine and Audio Visual Equipment*, 76 Vine Lane, Hillingdon UB10 0BE. Telephone: Uxbridge 33372

*Association of Cinematography, Television and Allied Technicians (ACTT)*, 2 Soho Square, London W1V 6DD. Telephone: 01 437 9418

*Association of Fashion, Advertising and Editorial Photographers Limited (AFAEP)*, 10A Dryden Street, London WC2E 9NA. Telephone: 01-240 1171/5

*Association of Illustrators*, Bar ey Mow Passage, Chiswick, London W4 4PH. Telephone: 01-994 6477

*Association of Photographic Laboratories (APL)*, 50 Great Russell Street, London WC1. Telephone: 01-405 2762.

*British Association of Picture Libraries and Agencies (BAPLA)*, 10 Cheyne Row, London SW3 5HL. Telephone: 01-352 5824.

*British Industrial and Scientific Film Association (BISFA)*, 26 D'Arblay Street, London W1V 3FH. Telephone: 01-439 8441/2.

*British Kinematograph, Sound and Television Society (BKSTS)*.

*British National Committee for High Speed Photography*. Secretary: C. W. Husbands, Royal Aircraft Establishment, Farnborough, Hampshire. Telephone: Aldershot 24461, extension 3540.

*British Photographic Export Group (BPEG)*, 76 Vine Lane, Uxbridge, Middlesex. Telephone: Uxbridge 333/2

*British Photographic Association (BPA)*, 8 St Bride Street, London EC4A 4DA. Telephone: 01-353 3020

*British Standards Institution (BSI)*, 2 Park Street, London W1A 2BS. Telephone: 01-629 9000. (prepares and publishes national standards for every sector of industry, including photography, cinematography, etc).

*British Universities Film Council Limited (BUFC)*, 72 Dean Street, London W1V 5HB. Telephone: 01-734 3687. ('a representative body for universities and institutions of university standard whose object is to

foster the production and use of film and related material for the purpose of teaching and research')

*Bureau of Freelance Photographers (BFP)*, Focus House, 497 Green Lanes, London N13 4BP. Telephone: 01-882 3315/6. (information to members only, about markets and fees).

*Central Office of Information*, Hercules Road, London SE1. Telephone: 01-928 2345

*City and Guilds of London Institute (CGLI)*

*Council for Educational Technology for the United Kingdom (CET)*, 160 Great Portland Street, London W1N 5TB. Telephone: 01 580 7553/4. ('the central organisation for promoting the application and development of educational technology at all stages' of education and training throughout the United Kingdom').

*Educational Foundation for Visual Aids (EFVA)*, 33 Queen Anne Street, London W1M 0AL. Telephone: 01 636 5742 (responsible for the National Audio Visual Aids Centre and the National Audio Visual Aids Library)

*Film Industry Training and Apprenticeship Council (FITAC)*, Nascreno House, 27 Soho Square, London W1V 5FL. Telephone: 01-734 2142. ('to deal with matters relating to training and apprenticeship in film production')

*Film Producers Guild Limited*, Guild House, Upper St Martin's Lane, London WC2. Telephone: 01-836 5420

*Films of Scotland Committee*, 3 Randolph Crescent, Edinburgh EH3 1JT. Telephone: 031-225 2763. ('to promote, stimulate and encourage the production and circulation of Scottish films of national interest')

*Industrial Council of Educational and Training Technology Limited (ICETT)*, 8 Leicester Street, London WC2H 7BN. Telephone: 01 437 0678. ('to co-ordinate interests of manufacturers of equipment and producers of programmes and systems used for education and training')

*Institute of Incorporated Photographers (IIP)*

*Institute of Journalists (IOJ)*, 1 Whitehall Place, London SW1A 2HE. Telephone: 01 930 7441

*Institute of Medical and Biological Illustration (IMBI)*, 27 Craven Street, London WC2

*Institute of Medical Illustrators in Scotland (IMIS)*, Department of Medical Photography and Illustration, Southern General Hospital, Glasgow, SW1. Telephone 041-445 2466, extension 778

*Institute of Photographic Apparatus Repair Technicians (IPART)*, 228 Regents Park Road, London N3 3HP

*Institute of Practitioners in Advertising (IPA)*, 44 Belgrave Square, London SW1X 8QS. Telephone 01 235 4404.9

*Institute of Reprographic Technology (IRT)*, Stephen House, 52-55 Carnaby Street, London, W1V 1PF. Telephone: 01-734 6584 ('the improvement of the knowledge of graphic reproduction technology and its effectiveness of service whenever used')

*Institute of Science Technology (IST)*, 345 Grays Inn Road, London WC1X 8PX. Telephone: 01-837 2207. ('advancement of knowledge of science laboratory techniques and the promotion of the professional status of technicians')

*International Council of Graphic Design Associations (ICOGRADA)*

*Irish Professional Photographers Association (IPPA)*, 12 Ludford Road, Dublin 14, Eire

*Master Photographers' Association (MPA)*, TMT House, 1 West Ruislip Road, Ruislip, Middlesex HA4 7DW. Telephone: Ruislip 30876

*Microfilm Association of Great Britain (MAGB)*, 1-2 Trinity Churchyard, High Street, Guildford, Surrey GU1 3RW ('promotion of the effective use of microfilm and document reproduction')

*National Audio Visual Aids Centre (NAVAC)*, 254-256 Belsize Road, London NW6 4BT. Telephone: 01-624 8812. ('centralised source of information and advice on AVA equipment, materials and methods. Courses in educational technology')

*National Audio Visual Aids Library*, 2 Paxton Place, Gipsy Road, London SE27. Telephone: 01-670 4247/9.

*National Committee for Audip Visual Aids in Education (NCAVAE)*, 33 Queen Anne Street, London W1M 0AL. Telephone: 01-636 5791. ('to co-ordinate, at national level, work being done in the field of AVA')

*National Film Institute of Ireland*, 65 Harcourt Street, Dublin 2, Eire. Telephone: Dublin 753638 and

754359. ('all aspects of the use of film in education'). *National Reprographic Centre for Documentation*, Hatfield Polytechnic Annexe, Endymion Road, Hatfield, Hertfordshire. Telephone: Hatfield 66144/5. *National Union of Journalists (NUJ)*, 314 Gray's Inn Road, London WC1X 8DP. Telephone: 01-278 7916. *Photogrammetric Society*, 47 Tothill Street, London SW1. Telephone: 01-953 6161. ('the art and science of mapping by aerial photography'). *Photographic Dealers' Association (PDA)*, 232-238 High Street North, London E12 6SB. Telephone: 01-471 0941. *Photographic Society of Ireland*, 11 Hume Street, Dublin 2, Eire. ('advancement of the scientific and art of photography'). *Photographic Instrument Repairing Association (PIRA)*, PO Box 161, Leicester LE3 0SR. *Printing and Publishing Industry Training Board (PPITB)*. *Professional Photographic Laboratories Association (PPLA)*, 1 West Ruislip Station, Ruislip, Middlesex HA4 7DW. Telephone: Ruislip 30718. *Professional Photographers Association of Northern Ireland (PPANI)*, Johnston Studios, 16 Mill Street, Comber, Newtownards, Co Down, N Ireland. Telephone: Newtownards 872578. *Royal Microscopical Society (RMS)*, Clarendon House, Cornmarket Street, Oxford. Telephone: Oxford 48768. *Royal Photographic Society of Great Britain (RPS)*. *Royal Society of Arts (RSA)*. *Scientific Film Association (SFA)*, 48 Austen Paths, Stevenage, Hertfordshire SG2 0NR. Telephone: 01-427 4380 extension 163 ('the use of film and video in, or on, science'). *Scientific Instrument Manufacturers Association of Great Britain (SIMA)*, 20 Peel Street, London W8 7PD. Telephone: 01-727 2614. *Sira Institute - Lens Users Association*, South Hill, Chislehurst, Kent BR7 5EH. Telephone: 01-467 2636. (R and D centre for measurement, control and automation). *Scottish Educational Film Association*, 16-17 Woodside Terrace, Glasgow G3 7XN. Telephone: 041-332 5413. ('promotion of the use of educational film, television, tape recording and other audiovisual media'). *Scottish Film Council*, 16-17 Woodside Terrace, Glasgow G3 7XN. Telephone: 041-332 5413. ('stimulate the interest in the use of film as an educational and cultural medium'). *Society for Education in Film and Television (SEFT)*, 63 Old Compton Street, London W1V 5PN. Telephone: 01-734 5455/3211. ('the promotion of the study of the cinema and television as part of the normal classroom work in school; the encouragement of the formation of school film societies and children's film making'). *Society of Industrial Artists and Designers (SIAD)*. *Society of Lithographic Artists, Designers, Engravers and Process Workers (SLADE)*, Slade House, 55 Clapham Common South Side, London SW4 9DF. Telephone: 01-720 7551. *Society of Photographic Printers*, 67 Albert Road, London E18. (a section of the Sign and Display Trades Union). *Technician Education Council (TEC)*. *The Press Association Limited*, 85 Fleet Street, London EC4. Telephone: 01-353 7440.

## Western Europe

*Associazione Fotografi Italiani Professionisti*, Viale Monza 111, 20125 Milano, Italy.

*Bundesinnung der Photographen Oesterreichs*, Bauernmarkt 13, 1011 Wien, Austria. *Bund Freischaffender Foto-Designer eV*, Landhausstrasse 59, 7000 Stuttgart 1, Federal German Republic. *Centralverband Deutscher Photographen*, Max-Joseph Strasse 4, 8 München 2, Federal German Republic. *Dansk Fotografisk Forening*, Valdemarsgade 19, 1665 Copenhagen V, Denmark. *Fédération Nationale de la Photographie Professionnelle*, rue Timmermans 14, 1190 Bruxelles, Belgium. *Groupeement National de la Photographie Professionnelle*, Rue Montyon 8, 75009 Paris, France. *Norges Fotografforbund*, Rosenkranzgaten 7, Oslo 1, Norway. *Suomen Valokuvaajain Littory SLV*, Korkeavuorenkatu 2b F72, 00140 Helsinki, Finland. *Svenska Fotografernas Förbund*, Nytorgsgatan 17, 116 22 Stockholm, Sweden. *Union Suisse des Photographes*, Monbijoustrasse 14, Postfach 1212, 3001 Bern, Switzerland. *Vereniging van Beroepsfotografen in Nederland*, Nieu Keizersgracht 58, Amsterdam 1018, Netherlands.

## North America

*American Institute of Graphic Arts*, 1059 Third Avenue, New York, NY 10021, USA. *American Society of Cinematographers*, 1782 North Orange Drive, Hollywood, California 90028, USA. *American Association for the Advancement of Science*, 1515 Massachusetts Avenue NW, Washington, DC 20005, USA. *American Society of Magazine Photographers*, 205 Lexington Avenue, New York, NY 10016, USA. *American Society of Photogrammetry*, 105 North Virginia Avenue, Falls Church, Va 22046, USA. *Association for Multi-image*, 947 Old York Road, Abingdon, PA 19001, USA. *Biological Photographic Association*, 6650 Northwest Highway, Chicago, Illinois 60631, USA. *Canadian Film Institute*, 75 Albert Street, Suite 1105, Ottawa, Ontario K1P 5E1, Canada. *Graphic Arts Technical Foundation*, 4615 Forbes Avenue, Pittsburgh, PA 15213, USA. *Gravure Technical Association*, Suite 858, 60 East 42nd Street, New York, NY 10017, USA. *IFPA, Film and Video Communicators*, 3518 Cahuenga Boulevard West, Suite 313, Hollywood, California 90068, USA. *International Industrial Television Association*, PO Box 297, Summit, New Jersey 07901, USA. *National Audio-Visual Association Inc*, 3150 Spring Street, Fairfax, Va 22030, USA. *National Microfilm Association*, Suite 1101, 8728, Colesville Road, Silver Spring, Md 20910, USA. *National Press Photographers Association*, Box 1146, Durham, NC 27702, USA. *Photo Marketing Association International*, 603 Lansing Avenue, Jackson, Miss 39202, USA. *Photographic Society of America*, 2005 Walnut Street, Philadelphia, PA 19103, USA. *Professional Photographers of America Inc*. *Research and Engineering Council of the Graphic Arts Industry*, 1411 K Street NW, Washington, DC 20005, USA. *Society of Motion Picture and Television Engineers*, 862 Scarodale Avenue, NY 10583, USA. *Society of Photo-Technologists (SPT)*, PO Box 2863, Fullerton, Calif 92633, USA. *Society of Photographic Scientists and Engineers*, Suite 204, 1330 Massachusetts Avenue NW, Washington, DC 20005, USA.

*Underwater Photographic Society*, PO Box 15921, Lo Angeles, Calif 90015, USA.

## Association Internationale du Film d'Animation (ASIFA)

*Secretariat: Dr George Matolcsy, 1021 Budapest, Voroshadsereg U.64, Hungary*  
*Uk Secretariat: 3-7 Kean Street, London WC2* Telephone: 01-240 3888/3126

Founded in Paris in 1959, ASIFA's aims are the enrichment and development of animation on an international level, co-operation and free exchange of ideas, experience and information, promotion of animation as an independent art; and a search for new ways of artistic expression.

Publications include a quarterly information bulletin to membership and books on various aspects of animation

## British Film Institute (BFI)

*81 Dean Street, London W1V 6AA. Telephone: 01-437 4355*

## British Kinematograph, Sound and Television Society (BKSTS)

*110-112 Victoria House, Vernon Place, London WC1B 4DJ. Telephone: 01-242 8400*

## Bureau of European Designers' Associations (BEDA)

*c/o SIAD, 12 Carlton House Terrace, London SW1 5AH.*

## Europhot

*Secretariat: European House of Photography, 26 quai des Messageries, F-71100 Chalon-sur-Saône, France. Telephone: 84/48.41.98*

## ICOGRADA (International Council of Graphic Design Associations)

*Warren House, St Pauls Cray Road, Chislehurst, Kent BR7 6QA. Telephone: 01-467 5718.*

## Institute of Incorporated Photographers (IIP)

*Amwell End, Ware, Hertfordshire, SG12 9HN. Telephone: 0920 4011.*

The Institute has a responsibility for photographic education, via its Professional Qualifying and Vocational Examinations; and it officially 'recognises' certain schools of photography. Regular publications include *The Photographer* (monthly) and the *IIP Register and Guide for buyers of photography*. *Conditions of Employment in Professional Photography* is a publication recommending a clearly defined career structure within the profession.

## Professional Photographers of America Incorporated (PP of A)

*1090 Executive Way, Des Plaines, Illinois 60018, USA*  
*Telephone: (area code 312) 299-8161*

## Royal Photographic Society of Great Britain (RPS)

*14 South Audley Street, London W1Y 5DP. Telephone: 01-493 3967*

There are twelve specialist groups of the society dealing with aerial, archaeological, audiovisual, colour, education, historical, medical, motion picture, nature pictorial, scientific and technical and visual journalism

## Royal Society of Arts (RSA)

*John Adam Street, Adelphi, London, WC2N 6EZ*  
*Telephone: 01-839 2366*

## Society of Industrial Artists and Designers (SIAD)

*Nash House, 12 Carlton House Terrace, London SW1Y 5AH. Telephone: 01-930 1911*

PUBLICATIONS

ANNUALS

United Kingdom

*British Journal of Photography Annual*, 24 Wellington Street, London WC2E 7DH.  
*Photography Year Book*, 13-35 Bridge Street, Hemel Hempstead, Herts.

Japan

*Asahi Pentax Annual*, 3-21-20 Mishiazabu, Minato-ku, Tokyo 106.

Netherlands

*Photography Year*, Time-Life International (Nederland) BV, Amsterdam (in various languages)

Switzerland

*Photographis*, 107 Dufourstrasse, 8008 Zürich.

USA

*Modern Photography Annual*, 130 East 59th Street, New York, NY 10022, USA.

USSR

*Photo*, Planeta Publishers, Petrovka 8, Moscow (E).

MAGAZINES

Publications of professionnal associations which themselves have a separate entry in the Directory are not included. The indicator (E) is given when a publication from a non-English speaking country is known to have at least part of the text in English, or appears in an English/American edition.

United Kingdom

*Amateur Photographer*, Surrey House, 1 Throwley Road, Sutton, Surrey SM1 4QQ. Weekly.  
*Audio Visual*, PO Box 109, Davis House, 69-77 High Street, Croydon, Surrey CR9 1QH. Monthly.  
*British Image*, Arts Council of Great Britain, 105 Piccadilly, London W1V 0AU. Twice yearly.  
*British Journal of Photography*, 24 Wellington Street, London WC2E 7DH. Weekly.  
*Camera User*, Bretton Court, Bretton Centre, Peterborough PE3 8DZ. Monthly.  
*Camerawork*, Half Moon Photography Workshop, 119-121 Roman Road, Bethnal Green, London E2. Quarterly.  
*Creative Camera*, 19 Doughty Street, London WC1N 2PT. Monthly.  
*Film Making*, 15-23 Porteous Road, London W2 1UT. Monthly.  
*History of Photography*, 10-14 Macklin Street, London WC2B 5NF. Quarterly.  
*Industrial and Commercial Photographer*, PO Box 109, Davis House, 69-77 High Street, Croydon, Surrey CR9 1QH. Monthly.  
*Moviemaker*, 13-35 Bridge Street, Hemel Hempstead, Herts. Monthly.  
*Photographers*, Impressions Gallery of Photography, 17 Colliergate, York YO1 2BN.  
*Photography*, 13-35 Bridge Street, Hemel Hempstead, Herts. Monthly.  
*Photo Technique*, 15-23 Porteous Road, London W2 1UT. Monthly.  
*Practical Photography*, Bretton Court, Bretton Centre, Peterborough PE3 8DZ. Monthly.  
*Reprographics Quarterly*, NRCd, Hatfield Polytechnic, Endymion Road Annexe, Hatfield Herts AL10 8AU. Quarterly.  
*SLR Camera*, 38-42 Hampton Road, Teddington, Middlesex TW11 03E.  
*Ten-8*, Sidelines, 81 Grove Lane, Handsworth, Birm-

ingham B21 9HE. Quarterly  
*Viz*, FZ Publications Limited, 24 Harcourt Terrace, London SW10. Monthly  
*Widescreen*, 88 Marylebone High Street, London W1M 3DE. Bi-monthly  
*You and Your Camera*, 87 Elystan Road, London SW3 6RL. Weekly  
*Zoom*, 15 23 Porteous Road, London W2 1UT

Argentina

*Fotografias*, Editorial Foco SLR, Monroe 5117, Buenos Aires

Australia

*Australian Photography*, 381 Pitt Street, Sydney Monthly.  
*Industrial Photography and Commercial Camera*, 28 Chippen Street, Chippendale, NSW 2008. Monthly  
*Photo Trade News*, 381 Pitt Street, Sydney

Austria

*Filmkunst*, Rauhensteingasse 5, 1010 Vienna  
*Der Österreichische Filmamateuer*, Neubaugasse 36, 1070 Vienna  
*Der Photograph*, Salesianergasse 1, 1030 Vienna  
*Osterreichische Foto-Zeitung*, Richterergasse 4, 1071 Vienna.

Belgium

*Ciné Dossiers*, 30 rue de l'Etuve, 1000 Brussels  
*Cinéma Belge*, 12 rue Paul-Emile Janson, 1050 Brussels.  
*Focale*, 24 avenue J. S. Bach, 1080 Brussels.  
*Labo Courier*, 204 avenue Brugmann, 1180 Brussels  
*Phocigraf*, Bd Louis Schmidt 52, 1040 Brussels.  
*Snap-Shot*, Pacifaciestraat 70, Antwerp 2000

Canada

*Canadian Photography*, 481 University Avenue, Toronto, Ontario M5W 1A7. Monthly  
*Ovo Magazine*, PO Box 1431, Station A, Montréal, Québec H3C 2Z9. Quarterly (E).  
*Photo Canada*, 481 University Avenue, Toronto, Ontario, M5W 1A7. Monthly.

Czechoslovakia

*Fotografie*, Diouhá trida 12, 11589 Prague 1. Monthly

Finland

*Kaitafilmi*, Lönnrotinkatu 15, 00120 Helsinki 12  
*Kamera Lehti*, Kalevankatu 21 A5, 00100 Helsinki 10  
*Valokuva*, Korkeavuorenkatu 2bF 72, 00140 Helsinki 14.

France

*Cinéma pratique*, 16 quai de la Marne, 75019 Paris  
*Contact*, 135 rue de Rennes, Paris.  
*News Reporter*, 29 rue Claude-Terrasse, 75016 Paris  
Eight issues/year.  
*Le Nouveau Photocinéma*, 189 rue Saint-Jacques, 75005 Paris.  
*Pho`Argus*, 3 place Malesherbes, 75017 Paris.  
*Le Photographe*, 189 rue Saint-Jacques, 75005 Paris  
*Photo-Revue*, 118bis rue d'Assas, 75006 Paris  
*Sonovision*, 15 rue d'Aboukir, 75002 Paris  
*Le Technicien du Film*, 79 Champs-Élysées, 75008 Paris.  
*Zoom*, 2 rue du Faubourg Poissonnière 75010 Paris  
Bi-monthly.

German Democratic Republic

*Fotografie*, Postfach 67, 7031 Leipzig. Monthly

German Federal Republic

*Cinephoto Journal*, Leopoldstrasse 33, 8000 Munich.  
*Color-Foto*, Stridbeckstrasse 48, 8000 München 71. Monthly.

*Der Deutsche Kameramann*, Rotbuchenstrasse 21, 8000 Munich 30.  
*51 Format*, Grotzinger Strasse 61, 7500 Karlsruhe 41.  
*Fernseh und Kinotechnik*, Eichborndamm 141, 1000 Berlin 52  
*Film + Foto*, Fachnerstrasse 43, 8000 Munich 21.  
*Film und Ton-Magazin*, Orterstrasse 8, 8000 Munich 70  
*Film 8/16*, Oranienstrasse 8, 6272 Niederhausen  
*Film-echo und Filmwoche* (incorporating *Filmblätter*), Gutenbergstrasse 13, 6201 Nordenstadt  
*Focus*, Landstrasse 69, 6000 Frankfurt/Main  
*Foto Contact*, Tiefenbroicherstrasse 69, 4030 Ratingen  
*Foto Magazin*, Orterstrasse 8, 8000 Munich 70  
*Foto und Film Hobby*, Postfach 1215, 7000 Stuttgart 1  
*Fotografie*, Wolfgang-Schulz-Verlag Soonwaldstrasse 23, D-6541 Reisweiler Quarterly  
*Inpho*, Postfach 3533, 4000 Dusseldorf  
*International Photo Technik*, Rupert Mayer Strasse 45, 8000 Munich 25. Quarterly. (E)  
*Kamera und Schule*, Anzinger Strasse 1, 8000 Munich 80  
*Leica-Fotographie*, Stuttgarterstrasse 18-24, 6000 Frankfurt/Main. (E)  
*MFM Moderne Fototechnik*, Teinacher Strasse 34, 7140 Lügwigberg  
*Photo*, Herzogstrasse 64, 8000 Munich 40  
*Photoblätter*, Stuttgarterstrasse 18-24, 6000 Frankfurt/Main  
*Der Photo-Markt*, Postfach 3533, 4000 Dusseldorf.  
*Photo Presse*, Postfach 1348, 3510 Hannover-Münden 1  
*Rolleigrafie*, Rolleiwerke, Brunswick  
*Schmalfilm*, Markgratenstrasse 11, 1000 Berlin 61  
*Zoom*, Stridbeckstrasse 48, 8000 München 71. Bi-monthly

Hungary

*Foto*, Lenin Korút 9-11, 1073 Budapest Monthly

Israel

*Hatzilum*, PO Box 34043, Tel-Aviv

Italy

*Il Diaframma*, Via degli Imbriani 15, 20158, Milan Monthly  
*Fotografare*, Via Macalle 2, 00199 Rome. Monthly  
*Foto-Notizario*, Via Melloni 17, 20120 Milan  
*Fotopratica*, Via F. Bellotti 7, 20129, Milan  
*Nuova Fotografia*, Via Manzoni 214, 80123 Naples  
*Progresso Fotografico*, Viale Piaceno 14, 20129 Milan.  
*Rivista Tecnica di Cinematografia*, Viale Campania 23, Milan  
*Tutti Fotografi*, Viale Piaceno 14, 20129 Milan

Japan

*Asahi Camera*, Asahi Shimbun, Tokyo 100. Monthly. (E).  
*Camerart*, Hinode Building 11, 2-Chome, Kyobashi, Chuo-ku, Tokyo. Monthly. (E)  
*Camera Mainichi*, Mainichi Daily News, 1-1 Hitotsu-bashi, Chiyoda-ku, Tokyo. Monthly.  
*Japan Camera Trade News*, 18-2, Shibuya 3-chome, Shibuyaku, Tokyo 150. Monthly. (E).  
*Nippon Camera*, 1-5-15 Ningyo-cho, Nihonbashi Chuoh-ku, Tokyo. Monthly.  
*Photo International*, Meiko Building, 11-11, Shinjuku-1-chome, Shinjuku-ku, Tokyo.

The Netherlands

*Focus*, Postbus 26, Koningin Wilhelminalaan 12, Amersfoort. Monthly.

*Foto-Visie*, Postbus 16, Nijmegen.  
*NBF-Bulletin*, Keizersgracht 238, Amsterdam C.

## Poland

*Fotografia*, Skrytka pocztowa 169, 00950 Warsaw Monthly.  
*Foto Kronika*, Skrytka pocztowa 169, 00950 Warsaw.

## Portugal

*Foto*, Rua Conde de Rio Major 10, 10 c/v EF-Alges, Lisbon.

## Spain

*Arte Fotografico*, Don Ramon de la Cruz 53, Madrid 1.  
*Cinema 2002*, Ardemans 64, Madrid 28.  
*Enfoques*, Capital, Cordoba 6070.  
*Flash Foto*, Rocafort 39-41, Barcelona 15.

## Sweden

*Aktuell Fotografi*, Box 186, 25103 Helsingborg. Monthly.  
*Foto*, 10544 Stockholm.  
*Fotonyheterna*, Kungstensgaten 20, 11357 Stockholm. Monthly.  
*Hasselblad*, Victor Hasselblad AB, Box 220, 40123 Göteborg 1.

## Switzerland

*Camera*, Zürichstrasse 3, Lucerne. Monthly. (*E*).  
*Foto Film Ton*, Postfach 6/66, 8953 Dietikon.  
*L'Objectif*, 12 rue des Mouettes, Geneva.  
*Photo-Ciné Expert/Photo Kino Berater*, 7 rue Cingria, 1211 Geneva 9.  
*Print Letter*, Postfach 250, 8046 Zurich. Bi-monthly. (*E*).  
*Schweizerische Photorundschau*, 1800 Vevey.  
*Schweizer Phot' Argus/Phot' Argus Suisse*, 40 rue de Vollandes, 1207 Geneva.

## USA

*American Photographer*, 1 East 53rd Street, New York, NY 10022.  
*Aperture*, Elm Street, Mullerton, NY 12546. Quarterly.  
*Audio-Visual Communication*, 750 Third Avenue, New York, NY 10017.  
*The Camera Craftsman*, 2000 Western Union Avenue, Englewood, Col 80110.  
*Camera 35*, 420 Lexington Avenue, New York, NY 10017.  
*Film-maker's Newsletter*, PO Box 115, Ward Hill, Mass 01830.  
*Image*, George Eastman House, 900 East Avenue, Rochester, NY 14607. Quarterly.  
*Industrial Photography*, 750 Third Avenue, New York, NY 10017.  
*Journal of Applied Photographic Engineering*, 1411 K St. NW, Washington, DC 20005.  
*Journal of the Biological Photographers' Association*, 1740 Salt Road, Rochester, NY 14450.  
*Modern Photography*, 130 East 59th Street, New York, NY 10022. Monthly.  
*Movie Making*, 8490 Sunset Boulevard, Los Angeles, Ca. 90069.  
*News Photographer*, 170 West End Avenue, New York, NY 10023.  
*Optical Engineering*, PO Box 10, 405 Fieldston Road, Bellingham, WA 98225.  
*Petrsen's Photographic Magazine*, 6725 Sunset Boulevard, Los Angeles, Cal 90028. Monthly.  
*Photogrammetric Engineering and Remote Sensing*, 105 N. Virginia Avenue, Falls Church, VA 22046.  
*Photograph*, 210 Fifth Avenue, New York, NY 10010. Ten issues/year.  
*Photo Information Almanac*, 130 East 59th Street, New York, NY 10022, USA.

*Photomarketing*, 603 Lansing Avenue, Jackson, Mich 49202.

*Photomethods*, 1 Park Avenue, New York, NY 10016. Monthly.  
*Popular Photography*, 1 Park Avenue, New York, NY 10016. Monthly.  
*The Professional Photographer*, Executive Way, Des Plaines, Ill 60018.  
*SMPTE Journal*, 901 Meadow Lakes, Eltra Road, Highstown, NJ 08520.  
*Studio Photography*, 250 Fulton Avenue, Hempstead, Long Island, NY 11550.  
*Super-8 Filmmaker*, 3161 Fillmore Street, San Francisco, Cal 94123.  
*Technical Photography*, 250 Fulton Avenue, Hempstead, Long Island, NY 11550. Monthly.  
*35mm Photography*, 1 Park Avenue, New York, NY 10016.  
*Videography*, 750 Third Avenue, New York, NY 10017. Monthly.

## USSR

*Sovietskoie Foto*, M Lubyanka 14, 101878 Moscow (Centre).

## Venezuela

*Foton Viaja*, Avenue Maturin 15 altos, Los Cedros, Caracas.

## Yugoslavia

*Fotografija Film*, Ilirska 9, 11000 Belgrade.  
*Foto Kino Revija*, Bulevar Revolucije 44, 11000 Belgrade.

# REFERENCE WORKS

*Art Directors' Index to Photographers, No 5*  
Published by Chapman, Morris, Williams Limited, 3a Wychcombe Studios, Englands Lane, London NW5 4XY. Lists over 4000 international professional photographers and provides a representative selection of the work of 235 of them.  
*Audio Visual Equipment Directory*, National Audio-Visual Association Inc, 3150 Spring Street, Fairfax, Virginia 22030, USA.  
*Australian Photography Directory, with Australian Photography*, Globe Publishing Company, Castle-reagh Street, Sydney, New South Wales, Australia.  
For further reference see:  
*Directory of British Photographic Collections*, compiled by John Wall and published by Heinemann for the National Photographic Record, London, 1977.

*British Qualifications* compiled by Barbara Priestly, and published by Kegan Page, 116a Pentonville Road, London N1 9JN. Contains comprehensive listings of educational, professional and academic qualifications in the United Kingdom.  
*Canadian Industrial Photography, Directory of Goods and Services*, French-English, Maclean-Hunter Company Limited, 481 University Avenue, Toronto 2, Ontario, Canada.  
*The Creative Handbook*, published by the Creative Handbook Limited, 9 Chichester Chambers, 13 Chichester Rents, Chancery Lane, London WC2. This is published annually as a comprehensive directory of suppliers to the advertising and graphics industry. The handbook uses the following listings: creative and design consultants, designers, writers, illustrators, photographers, photo libraries, models, stylists, props, locations, photo processors, art and photo suppliers,

audio-visual and video services, art studios: retouchers, typographers, print services, TV and radio production, post-production services, music, recording studios and viewing theatres, exhibition and promotional contractors, employment agencies and advertising agencies. *The Creative Handbook* covers the UK and *The Creative Handbook - Europe* the rest of Europe. 9 Chichester House, Chancery Lane, London WC2.

*Director and Buyers' Guide*, Distinctive Publications Limited, PO Box 109, Davis House, 69-77 High Street, Croydon CR9 1QH. Published as a supplement to the *Industrial and Commercial Photographer Directory and Buyers' Guide*, Distinctive Publications Limited, PO Box 109, Davis House, 69-77 High Street, Croydon CR9 1QH. Published as a supplement to *Audio Visual*

*Directory of Photocopying and Microcopying Services*, 2nd edn, FID publication 273, International Federation for Documentation, Den Haag, Netherlands

*Directory of Professional Photography and Buyers' Guide*, Professional Photographers of America Inc, 1090 Executive Way, Des Plaines, Illinois 60018, USA.  
*Madison Avenue Europe*, published by Peter Glenn Publications Limited, New York. UK representative: Sweatman and Fordham. Telephone: 01-370 6269. For specialist listings of advertising agencies, publications, PR firms, TV and film producers, illustrators, photographic studios and attendant services, model agencies, etc. Also included comprehensive travel information and maps. Cities covered: London, Paris, Amsterdam, Brussels, Copenhagen, Stockholm, Oslo, Milan, Rome, Zurich, Vienna, Madrid, Barcelona and five areas in West Germany. For America see *Madison Avenue Handbook and Madison Avenue West*.  
*Motion Picture and TV Service Directory*, Motion Picture Enterprises Publication Inc, Tarrytown, NY 10591, USA. (Semi-annual).

*Optical Industry and Systems Directory*, Optical Publishing Company, Pittsfield, Massachusetts 01201, USA.

*Photography: Source and Resources* by Steven Lewis, James McQuaid and David Tait. A source book for creative photography published by Turnip Press, Light Impressions Corporation, PO Box 3012, Rochester, NY 14650, USA.

*Photographic Trade News, Master Buying Guide and Directory Issue*, PTN Publishing Co Inc, Room 310, 250 Fulton Street, Hempstead, NY 11550, USA. Issued as part of the annual subscription to *Photographic Trade News*

*Photokina Firmen und Waren* (Directory of Firms and Goods), Photokina, Messe-und-Austellung GmbH, 5 Köln-Deutz, PO Box 140, Köln, Federal German Republic. Published for use with exhibition and serves as a world-wide index to firms and goods in the photographic industry.  
*Photography Directory and Buying Guide*, Ziff-Davis Publishing Company, 1 Park Avenue, New York, NY 10016, USA.

*Photo Trader Directory*, Henry Greenwood and Company Limited, 24 Wellington Street, London WC2E 7DH.

*Willing's Press Guide*, published annually by Thomas Skinner Directories, RAC House, Lansdowne Road, Croydon, Surrey

*The Writers and Artists Year Book*, published annually by Adam and Charles Black, 35 Bedford Row, London WC1R 4JH. For information on journals, publishers literary agents, news and press agencies, art galleries markets for artists and photographers etc

# SCHOLARSHIPS, AWARDS AND GRANTS

## Further and Higher Education Grants

Within the United Kingdom, further education grants are currently administered by the Local Education Authority for the area where a person normally resides. The award of a grant is a complex procedure and depends on the level and duration of the proposed course of study as well as the personal and financial status of the individual. In many cases, particularly involving photography, the award is discretionary rather than mandatory on the part of the LEA. Further information can be obtained from local LEA offices or from the leaflet *Grants to Students – 1*. This is published from the Department of Education and Services and obtainable from the DES, Elizabeth House, 39 York Road, London SE1 7PH, or from the Welsh Education Office, 31 Cathedral Road, Cardiff CF1 9UJ. For information in Scotland, contact the Scottish Education Department, New St Andrew's House, St James Centre, Edinburgh EH1 3TD. In Northern Ireland, contact the Department of Education for Northern Ireland, Rathgael House, Balloo Road, Bangor, County Down BT19 2PR.

See *Grants for Higher Education* by Judith Booth for the Advisory Centre for Education (ACE), Barrie and Jenkins.

See also *The Grants Register*, published St James' Press, 1a Montague Mews North, London W1H 1AJ. The register lists scholarships and fellowships at all levels of graduate study, from regional, national or international sources, tenable in the UK or abroad. Lists also details of research grants, exchange opportunities, vacation study awards, travel grants, professional and vocational awards etc. Primarily for residents of the United States, Canada, the United Kingdom, Ireland, Australia, New Zealand, South Africa, and the developing countries.

## United Kingdom

*Arts Council Photography Grants: Photography Officer, Arts Council of Great Britain, 105 Piccadilly, London W1V 0AU. Telephone: 01-629 9495.*

Photographers, writers, historians, museums, galleries, public institutions and other non-profit-distributing organisations may apply for grants in the following categories: bursaries for photographers; exhibition subsidies for organisations; publication subsidies for publishers of books, magazines and catalogues; work in schools for educational projects; photographers in residence schemes; darkroom and other resources; and training grants for photographers and administrators.

*Churchill Travelling Fellowships: The Winston Churchill Memorial Trust, 15 Queen's Gate Terrace, London SW7 5PR. Telephone: 01-584 9315.*

The Trust offers Travelling Fellowships annually to UK citizens who are interested, whether professionally or as individuals, in certain specified fields. A different selection of categories in which application can be made is published each year. There are separate Trusts in Australia, New Zealand and the United States of America, for the citizens of those countries.

*Kodak Photographic Bursaries: The Administrator, Kodak Photographic Bursaries, Kodak Limited, PO Box 66, Kodak House, Station Road, Hemel Hempstead, Hertfordshire HP1 1JU. Telephone: Hemel Hempstead 61122.*

The bursaries are intended to stimulate and to extend the uses of photography and broaden the undertaking of photographic studies. The subject matter of the proposal is open with the proviso that it does not have

any commercial implications. The bursaries, awarded annually, take the form of monetary grants – a total of £7000 to provide two or more Open Bursaries but no bursary to exceed £3500, and a further £2500 to provide one or more Student Bursaries.

*PPITB Management Bursary Scheme: Management Development Unit, Printing and Publishing Industry Training Board, Clifton House, Triangle West, Bristol BS8 1EJ*

The scheme has as its primary aim the development of latent managerial talent at all levels. The three categories of award are: first degree scholarships, post-graduate bursaries and mid-career awards. They are intended to appeal broadly to junior, middle and senior management respectively and reflect the long-medium- and short-term aspects of an integrated management education strategy.

## Western Europe

Europhot offer scholarships and awards, the details of which may be found in the photographic press.

## North America

Photographic Art and Science Foundation, 111 Stratford Road, Des Plaines, Illinois 60016, USA

The Foundation offers scholarships and grants to students.

## WORKSHOPS AND SUMMER SCHOOLS

### United Kingdom

*Photographers' Place, Derbyshire.* (Photographers' Place, Bradbourne, Ashbourne, Derbyshire, DE6 1PB.) There are an increasing number of photographic workshops being organised through universities and the maintained sector of further and higher education. Currently courses are being offered in places as diverse as the University of Aston in Birmingham, Oxford Polytechnic and the Worcester College of Higher Education. Details can be found in a wide range of press outlets.

### Western Europe

*Swiss Photo Workshops* (Swiss Photo Workshops, PO Box 124, 5600 Lenzburg, Switzerland.)

### North America

*Anderson Ranch Arts Center, Aspen, Colorado.* (Anderson Ranch Arts Center, Box 2406, Aspen, Colorado 81611, USA.)

*Ansel Adams June Workshops, Yosemite National Park, California.* (Ansel Adams Gallery, June Workshops, Box 455, Yosemite National Park, California 95389, USA.)

*Apeiron Workshops, Inc., Millerton, New York* (Apeiron Workshops Inc, Box 551, Millerton, NY 12546, USA.)

*The Banff Centre School of Fine Arts, Banff, Alberta, Canada.* (Registrar, Banff Centre School of Fine Arts, Banff, Alberta, Canada, T0L0C0.)

*Center for Photographic Studies, Louisville, Kentucky.* (Center for Photographic Studies, Inc, 722 West Main Street, Louisville, Kentucky 40202, USA.)

*Chilmark Photography Workshop, Martha's Vineyard, Massachusetts.* (Carol Lazar, 75 Central Park West, New York, NY 10023, USA.)

*Colorado Mountain College, Breckenridge, Colorado.* (Ellen Manchester, Colorado Mountain College, PO Box 914, Breckenridge, Colorado 80424, USA.)

*Cornell University, Ithaca, New York.* (Prof Eldon Kenworthy, Summer Session, 105 Day Hall, Cornell University, Ithaca, NY 14853, USA.)

*Country School of Photography, South Woodstock,*

*Vermont.* (Country School of Photography, South Woodstock, Vt 05071, USA.)

*Essex Photographic Workshop, Essex, Massachusetts.* (Essex Workshop, Conomo Point Road, Essex, Mass 01929, USA.)

*Florida Professional Photography, Ft Lauderdale, Florida.* (Art Institute of Ft Lauderdale, 3000 East Las Olas Boulevard, Ft Lauderdale, Florida 33316, USA.)

*Friends of Photography, Carmel, California.* (Friends of Photography, Box 239, Carmel, California 93921, USA.)

*Holistic Life Seminars, San Francisco, California.* (The Holistic Life Foundation, 81 Market, Suite 822, San Francisco, California 94105, USA.)

*University of Georgia, Athens, Georgia.* (Photographic Design, Art Department, University of Georgia, Athens, Georgia 30602, USA.)

*International Center of Photography, New York.* (International Center of Photography, 1130 Fifth Avenue, New York, NY 10028, USA.)

*Lake Placid School of Art, Lake Placid, New York.* (Lake Placid School of Art, Photography Department, Lake Placid, NY 12946, USA.)

*Lightworks, Minneapolis, Minnesota.* (Director, Lightworks, 25 University Avenue Southeast, Minneapolis, Minnesota 55414, USA.)

*The Maine Photographic Workshop, Rockport, Maine.* (The Maine Photographic Workshops, Rockport, Maine 04856, USA.)

*Mendocino Art Center, Mendocino, California* (Zachary Franks, 230 SE 39th, Portland, Oregon, USA.)

*Northern Kentucky University, Highland Heights, Kentucky.* (Northern Kentucky University, Fine Arts and Communication Department, Highland Heights, Kentucky 41076, USA.)

*Oliver Gagliani Workshops, Virginia City, Nevada* (Oliver Gagliani Workshops, 12226 Moorpark Street, Studio City, California 91604, USA.)

*Ogunquit Photography School, Ogunquit, Maine* (The Ogunquit Photography School, Box 568, Ogunquit, Maine 03907, USA.)

*Oregon Photography Workshop, Eugene, Oregon* (Photography Workshop, 3241 Donald Street, Eugene, Or 97405 USA.)

*Panopticon Gallery, Boston, Massachusetts.* (Panopticon, 187 Bay State Road, Boston, Mass 02215, USA.)

*Peters Valley Craftsmen, Layton, New Jersey.* (Peters Valley Craftsmen Inc, Layton, New Jersey 07851, USA.)

*The Photography Place, Nantucket Island, Mass, and Littlebrook Farm, Pennsylvania.* (The Photography Place, Spread Eagle Village, 503 West Lancaster Avenue, Strafford, Pa 19087, USA.)

*Snowbird Summer Arts Institute, University of Utah.* (Division of Continuing Education, University of Utah, 1152 Annex Building, Salt Lake City, Utah 84112, USA.)

*Summervail Art Workshops, Vail, Colorado.* (Director, Summervail Art Workshop, Box 1114, Vail, Colorado 81657, USA.)

*Sun Valley Center, Sun Valley, Idaho.* (Director of Photography, Sun Valley Center, Box 656, Sun Valley, Idaho 83353, USA.)

*University Film Study Center, Amherst, Massachusetts.* (University Film Study Center, Box 275, Cambridge, Ma 02138, USA.)

*University of New Mexico, Albuquerque, New Mexico.* (Department of Art, University of New Mexico, Albuquerque, NM 87131, USA.)

*Visual Studies Workshop, Rochester, New York.* (Visual Studies Workshop, 4 Elton Street, Rochester, New York 14607, USA.)

# PROCESSING

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# BLACK AND WHITE PROCESSING

## General Instructions

### Making up solutions

Glass, plastic, new enamel or stainless-steel vessels should be used. The chemicals should be taken in order and each completely dissolved before adding the next, using about three-quarters of the final volume of water. Cold or tepid (35–40°C) water should be used, *not* hot water (exceptions are given below). Distilled or deionised water should preferably be used in making up the solutions, particularly the first and colour developers, but this is not essential, and tap water may be used. If the water supply is too hard, it is helpful to add, particularly to water destined for black-and-white and colour developers, *before* dissolving any other chemicals, 2 g/l of a sequestering agent: Calgon, sodium hexametaphosphate, or sodium tripolyphosphate.

Anhydrous carbonate should be dissolved separately in about three times its own bulk of hot water. Hot water must also be used to make up a hardener-bleach, which may throw down a white precipitate when cold, but this does not affect its working; stop baths are best made up cold. Time can be saved using 20% solutions of thiocyanate and bromide instead of solid reagent. Phenidone should be dissolved after the hydroquinone and alkalis.

All solutions should be allowed to stand for about 30min and filtered before use.

Practical metric measures (g=grams; ml=millilitres (=cm<sup>3</sup> for practical purposes); °C=°Celsius) are used throughout.

### Chemical names and synonyms

As far as possible the current preferred names have been used for chemicals. These are the names under which they will generally appear in manufacturers' catalogues. However, earlier editions of the *Annual* and *Almanac*, and formulae from other sources, may make use of alternative names. The most important of these are listed here:

Acid EDTA (see EDTA)  
Borax (= disodium tetraborate)  
Calgon ([trade name] = sodium hexametaphosphate)  
Caustic soda (= sodium hydroxide)  
Chlorquinol (= chloroquinol *or* chlorohydroquinone)  
Chrome alum (= chromic potassium sulphate)  
Diethylene glycol (= digol)  
2,5-Dimethoxytetrahydrofuran (= tetrahydro-2,5-dimethoxyfuran)  
Disodium phosphate (= disodium hydrogen orthophosphate)  
EDTA (= ethylenedinitrilotetra acetic acid, often called ethylenediamino-tetra-acetic acid *or* ethylene bisiminodiacetic acid). The acid has been referred to variously at times as Acid EDTA, EDTA, EDTAA, Ethadimil, Acide tetracémique, Havidote and tetracemic acid. Trade names include Irgalon and Sequestrene or Sequestrol (Geigy), Versene (Dow), Questex, Tetrine, Kalex, Trilon B, Komplexon, Complexone, Nervanaid (ABM Industrial Products Limited). Salts of this acid used photographically are EDTA NaFe (= EDTA ferric monosodium salt) and EDTA Na<sub>4</sub> (= EDTA tetrasodium salt). The name edetic acid for the acid,

the salts being edetates, has recently made its appearance in the British Pharmacopoeia Codex and the US Pharmacopoeia.

Ethylene diamine (= 1, 2-diaminoethane)

Formaldehyde (= formalin)

Glycin (= para-hydroxyphenylglycine *or* para-hydroxyphenyl aminoacetic acid)

IBT ([trade name] = benziotriazole)

Kodalk ([trade name] = sodium metaborate)

Monopotassium phosphate (= potassium dihydrogen orthophosphate)

Monosodium phosphate (= sodium dihydrogen orthophosphate)

Potash or potassium alum (= aluminium potassium sulphate)

Pyrocatechin (= catechol or 1, 2-dihydroxybenzene)

Sequestrene NaFe ([trade name] – see EDTA)

Sodium bisulphate (= sodium hydrogen sulphate)

Sodium bisulphite (= metabisulphite)

Sodium hydrosulphite (= sodium dithionite)

### Hydrated salts

Many of the salts used in these formulae may be obtained alternatively in anhydrous or hydrated forms, in some cases in several states of hydration. Some of the principal of these are as follows

*Disodium hydrogen orthophosphate* – available with 2H<sub>2</sub>O, 7H<sub>2</sub>O (relatively rare) or 12H<sub>2</sub>O. The relative quantities required are 1·00, 1·50, 2·00

*Ethylenediamine* in its hydrated form contains 80% of the pure substance relative quantities to be employed are therefore 1·00 and 1·25

*Magnesium sulphate* – has 1H<sub>2</sub>O in its hydrated form or 7H<sub>2</sub>O ('Epsom salts'). The relative quantities required are 1·00, 1·15, 2·05. The so-called dried form is of variable composition

*Sodium acetate* – has 3H<sub>2</sub>O in its hydrated form. The quantity relative to anhydrous required is 1·66 : 1·00

*Sodium carbonate* – available anhydrous, 1H<sub>2</sub>O (soda ash) or 10H<sub>2</sub>O (washing soda). The relative quantities required are 1·00, 1·26, 2·69.

Although specifications are frequently quoted in terms of the anhydrous salt, this is more difficult to dissolve than the stable monohydrate, sold as soda ash (note: this is available in a range of purities – many too impure for photographic use). The decahydrate, washing soda, tends to lose water of crystallisation and go powdery: its composition is then indefinite

*Sodium dihydrogen orthophosphate* – usually with 2H<sub>2</sub>O. The quantity required relative to the anhydrous material is 1·30 : 1

*Sodium sulphate* is available in the anhydrous form and with 10H<sub>2</sub>O. The relative quantities are 1·00 and 2·27. The anhydrous form may be unreliable unless dried before use.

*Sodium sulphite* – anhydrous, 7H<sub>2</sub>O or 10H<sub>2</sub>O. Relative quantities required are 1·00, 2·00, 2·27.

*Sodium thiosulphate* – has 5H<sub>2</sub>O in hydrated form. Quantity required relative to anhydrous is 1·57.

*Trisodium phosphate* – has 12H<sub>2</sub>O in hydrated form. Anhydrous and hydrate are not interchangeable by equivalent weight as the latter is more alkaline.

### Alkali solutions

*Sodium hydroxide* – although the traditional form of sodium hydroxide is as sticks or pellets, a convenient form of purchase for the small user is as a 40 or 50% weight/volume solution, which keeps indefinitely if stoppered. The

weights specified for pellets should be multiplied by 2.5 or 2 respectively. The pellets and sticks absorb both CO<sub>2</sub> and moisture readily  
*Ammonium hydroxide* – the standard form is '880 Ammonia', a reference to its density. This solution is 35% weight/volume. Dilution to 20 and 25% requires dilution with water in the ratios 100:75 and 100:40 respectively.

Activity

When strict accuracy is essential, the pH-value may be checked with a pH-meter (test papers are not suitable) and adjusted to the standard value by the addition of caustic soda (sodium hydroxide) pellets or flakes or the 40 or 50% solutions mentioned above – it is safest to use the dilute solutions – to raise the pH-value or, if necessary, sodium bisulphite or

Negative Developers

FINE GRAIN FORMULAE

All the formulae included here will give some refinement of grain over the developers in the other sections at a given exploitation of a film's speed. The actual degree of refinement will closely relate to the film speed reached *vis-a-vis* the normal ASA rating. Any increase in speed will give some increase in grain, although this can be kept to a minimum in carefully balanced formulae. On the other hand, very fine grain will only be obtained at some, albeit small, loss of film speed. When maximum sharpness and definition are required, refer to the Acutance Developer section: this gain may be at the expense of a slight increase in granularity and some loss of middle-tone gradation.

MEDIUM FINE GRAIN

D-76

Metol	2.0g
Sodium sulphite, anhydrous	100.0g
Hydroquinone	5.0g
Borax	2.0g
Water to	1000.0ml

D-76 Replenisher

Metol	3.0g
Sodium sulphite	100.0g
Hydroquinone	7.5g
Borax	20.0g
Water to	1000.0ml

This developer has come to be taken as a standard against which the granularity, speed, sharpness and definition given by other developers is compared. Thus a formula will be said to give such and such speed increase or loss, increased or less granularity, or higher acutance than D-76. It is marketed under various brand names such as ID-11, M & B 320, and sometimes with small formula changes. The use of the replenisher quadruples the life of the developer, which is otherwise about ten films per litre. Use replenisher without dilution to maintain level of solution in tank. D-76 gives some rise in activity on use and storage; the addition of 14 g/litre of boric acid crystals provides additional buffering, which will even out its action and give greater contrast control, with a 10–20% increase in developing time.

acetic acid to lower it. Liquid pH indicators, e.g. BDH, may be useful to the amateur.

Chemical suppliers

Most chemicals quoted in *The British Journal of Photography Annual* are available from Rayco Limited, Rayco Works, Blackwater Way, Ash Road Aldershot, Hants, telephone: 22725. The company is willing to add to its chemical list, which can be obtained by sending a stamped addressed envelope, according to user requirements. Koch-Light Laboratories Limited, Colnbrook, Buckinghamshire SL3 0BZ, telephone: Colnbrook 2262-5, stock a very complete range of chemicals, especially organic ones, and are suppliers to the large scale user, trade and industry

Adox M-Q Borax

Metol	2.0g
Sodium sulphite, anhydrous	80.0g
Hydroquinone	4.0g
Borax	4.0g
Potassium bromide	0.5g
Water to	1000.0ml

This variant formula of D-76 gives slightly better sharpness with a slower contrast rise. Development times are 10–20% longer. It is closely related to the ASA developer for miniature films, and the Ansco M-Q Borax formula.

For a Phenidone variant of this formula, see FX-3 and FX-18 (preferred) below.

Adox M-Q Borax Replenisher

Metol	3.0g
Sodium sulphite, anhydrous	80.0g
Hydroquinone	5.0g
Borax	18.0g
Water to	1000.0ml

Add 15-20 ml of replenisher for each 36 exposures or 120 size roll film in one litre or more, discarding some developer if necessary. This maintains quality and developing time.

ID-68 Ilford P-Q Fine Grain formula

Sodium sulphite	85.0g
Hydroquinone	5.0g
Borax	7.0g
Boric acid	2.0g
Phenidone	0.13g
Potassium bromide	1.0g
Water to	1000.0ml

This buffered borax formula gives a marked film speed increase over D-76 – about 30–60%, with a minimum increase in granularity, and good sharpness. Times 6–12min at 68°F. The developer, used undiluted, has a minimum change of activity with use. Results are comparable to Ilford 'Microphen'.

D-23

Metol	7.5g
Sodium sulphite, anhydrous	100.0g
Water to	1000.0ml

D-23 . . .

Increase development time by 10% after each film, until 8–10 films per litre have been processed. Use of replenisher extends life to 25 rolls per litre. Negligible film speed loss.

D-23 Replenisher

Metol	10·0g
Sodium sulphite, anhydrous	100·0g
Kodalk	20·0g
Water to	1000·0ml

Add 20ml for each 36 exposure length or 120 size roll film, discarding some developer if necessary. The amount applies to replenishment of 1 litre of developer or more. Replenisher identical to that for D-25.

The developer by R. W. Henn and J. I. Crabtree is the simplest medium fine grain formula. In general it gives good sharpness with slight resolution loss on some films; it is softer working than the D-76 type, and may give a slight increase in granularity; film speed very closely approaches normal.

Those workers beginning to weigh and make up their own solutions are recommended to try this formula in use with slow, medium speed films. Diluted 1 + 3 it resembles the Windisch compensating formula – see page 165, developing time 20–30 min approximately for slow and medium speed films. Use once and discard. With the Metol reduced to 5g it becomes Ferrania R33, giving still greater compensation for exposure errors and high contrast subjects.

D-76d, D-76b, Agfa 14, Agfa 15

D-76d is a 'buffered borax' version of D-76 (see also notes to D-76) giving greater contrast control, more consistent results on re-use, with a slight speed loss, and 25–50% time increase. Agfa 14 gives results similar to D-23 with similar times. D-76b is a motion picture and variable density sound track developer giving softer results than D-76 with similar times. Agfa 15 is suitable for some modern films notably the slow and medium speed ones, times 25% less than D-76 or ID-11, times in which are given in manufacturer's data sheets. The use of these formulae has fallen off in recent years, with the exception perhaps of D-76d. (See also the Ilford published P-Q fine grain formula ID-68 for a Phenidone buffered borax developer above.) The Ferrania developer R18 is identical to D-76d.

Quantities in grams	D-76d	Agfa 14	D-76b	Agfa 15
Metol	2	4·5	2·75	8
Sodium sulphite, anhydrous	100	8·5	100	125
Hydroquinone	5	—	2·75	—
Sodium carbonate, anhydrous	—	—	—	11·5
Borax	8	—	2·5	—
Boric acid	8	—	—	—
Potassium bromide	—	0·5	—	1·5
Water to 1 litre				

FX SERIES

This series of fine grain formulae was proposed by G. W. Crawley after lengthy research into the development of present-day films (*Brit J Photog*, Vol 107, 2, 9, 16, 23, 30 December (1960) and *ibid*, Vol 108, 6, 13, 27 January (1961)). He found that when the third quality of acutance was added to the requirements of minimum granularity and full film speed, changes might be advantageously made to the type of alkalinity and buffer

system employed in a developer. Furthermore, makes and types of film differed in the alkali-buffer restrainer system required to obtain best definition. FX-3 is the Phenidone variant of the Adox and ASA evolution of D-76 referred to above; FX-4 is a further variant giving higher film speed and more compensation, FX-5 gives very fine grain with the natural concomitant slight speed loss. FX-11 is balanced solely to give the fullest possible speed increase with the minimum granularity increase. FX-19 is a D-23 type formula giving, however, fuller emulsion speed. All modern films may be developed in any of these developers. FX-3 is the more suitable for the very fastest, as it gives the biggest contrast rise on extended development for low brightness range subjects. FX-18 is a P-Q version of D-76 claiming slightly higher resolving power, with a slight reduction in grain and minimal speed increase allowing use at stock strength without speed loss

Approximate meter-settings/makers rating

FX-5	– 30%
FX-18	+ 30%
FX-19	+ 30%
FX-3	+ 30%
FX-4	+ 60%
FX-7	+ 60%
FX-11	+ 80%-100%

Quantities in

grams	FX-5	FX-19	FX-3	FX-4	FX-11	FX-18
Metol	5	—	—	1·50	—	—
Phenidone	—	0·75	0·25	0·25	0·25	0·10
Hydroquinone	—	7	6	6	5	6
Glycin	—	—	—	—	1·50	—
Sodium sulphite						
anhydrous	125	100	75	100	125	100
Borax	3	—	2·5	2·5	2·5	2·5
Sodium						
bisulphate	—	—	—	—	—	0·35
Boric acid	1·5	—	—	—	—	—
Potassium						
bromide	0·5	—	1	0·5	0·5	1·6
Water to 1 litre						

In the FX-4 and FX-5 formulae dissolve a pinch of the sulphite first, then the metol, next the rest of the sulphite. Always dissolve the hydroquinone with or before the Phenidone, to prevent any temporary oxidation of the latter.

Average Capacity

FX-5	4–5 films per 600ml, 20% increase after each film 8–10 films per 1200ml, 10% increase after each film.
FX-19	5 films per 600ml, 10% increase after each film.
FX-11, FX-3	5–6 films per 600ml, 10% increase after each film.
FX-18, FX-4	6–8 films per 600ml, 10% increase after second or third and the subsequent ones.

N.B. FX-3 will show a rise in activity on storage and/or re-use similar to D-76.

Development times

In minutes at 20°C (68°F), using one tank inversion a minute or the normal in larger vessels.

Ilford	FX-19	FX-3	FX-4	FX-11	FX-18
Pan-F (MF)		4	4		6.5
Pan-F (RF)	as for	5	5		7.5
FP4 (MF)	FX-3	5	4.5		9
FP4 (RF)	but	7.5	7		9
HP5 (RF)	slower	8	7	as for	8
HP5 (MF)	contrast	7	6	FX-3	7
	rise				
Mark 5	after	7	6		7

Kodak	FX-19	FX-11 FX-3	FX-5	FX-4	FX-18
Pan-X (MF)		5	8	5	5.5
Pan-X (RF)	as for	6	9	5.5	6
Plus-X Pan	FX-3	5	9	5	5
(MF)	but				
Plus-X Pan	slower				
Prof (RF)	contrast	6.5	9	6	7
Veripan	rise	7	10	7	7.5
Tri-X (MF)	after	7	10	7	8
Tri-X (RF)		9	12	9	10
Royal-X		10-15	Pointless	9-15	15

### Changes in development times

Make a note of film batch numbers, and when using a new batch, watch for any unusual contrast change and adjust development time in future accordingly. The brief times above (e.g. on Ilford slow materials) will be found most convenient once temperature and agitation are standardised. Alteration of times by  $\pm 25\%$  will not affect meter setting in normal work, if required for contrast adjustment. FX-18 times are usually similar to those for D-76 and ID-11.

## VERY FINE GRAIN

### FX-5b

Metol	4.5g
Sodium sulphite, anhydrous	125.0g
Kodalk (Sodium metaborate)	2.25g
Sodium bisulphate	1.0g
Potassium bromide	0.5g
Water to	1000.0ml

### FX-5b Replenisher

Metol	7.0g
Sodium sulphite, anhydrous	125.0g
Kodalk (Sodium metaborate)	25.0g
Sodium bisulphate	—
Potassium bromide	1.0g
Water to	1000.0ml

Twenty per cent development time increase after first film until four or five films have been processed per 600ml or 10% increase until eight or ten films have been developed in 1200ml. Use replenisher to maintain level of tank until twenty-five rolls per litre are processed. Visual contrast is lower than the printing contrast. This formula gives true fine grain with good sharpness and the minimum loss of film speed (30–50%) necessary to achieve very fine grain (see also FX-5 below). Results resemble those in the original two-powder pack ‘Microdol’, found very suitable for Ilford and Adox films

amongst others, although replaced in Kodak usage by the later formula Microdol-X, giving improved definition on Kodak films

### Development times

In minutes at 20°C (68°F).  
Pan F (MF) – 10, Pan F (RF) – 12, FP4 (MF) – 8, FP4 (RF) – 12, HP5 (MF) – 11, HP5 (RF) – 13.

## ACUTANCE FORMULAE

*For maximum sharpness at some loss of fine grain*

### Pyrocatechin Surface Developer (Windisch)

#### Stock A

Pyrocatechin	80.0g
Sodium sulphite, anhydrous	12.5g
Water to	1000.0ml

#### Stock B

Sodium hydroxide	100g in 1000ml
------------------	----------------

### Working solution

Take 25ml of A, 15ml of B and make up to 1000ml. Develop 15–20min at 20°C according to film type. The developer keeps reasonably in stock, but deteriorates rapidly when mixed. It is used once and then discarded. Specially recommended by Windisch and Adox/Efke films. Emulsion speed approximately doubled.

**N.B.** It is best not to make up more of B than will be used rapidly since the activity will decrease with solution of atmospheric CO<sub>2</sub>. If possible hold only A as a stock, and add sodium hydroxide weighed up and dissolved on the occasion of use. Working concentration is 1.5g sodium hydroxide per litre.

### The Beutler Developer

#### Stock A

Metol	10.0g
Sodium sulphite, anhydrous	50.0g
Water to	1000.0ml

#### Stock B

Sodium carbonate, anhydrous	50.0g
Water to	1000.0ml

Working solution: 1 part A, 1 part B, 8 parts water.  
Developing times: 8–15min at 20°C (68°F).  
*See notes on making up FX-1 below for further details of preparing concentrated liquid developers.*

### ‘FX’ Acutance Developers

The following formulae were proposed by G. W. Crawley after research into the design of acutance developers.  
FX-1 is fundamentally a variant of the Beutler formula claiming better contrast control, together with a mechanism to enhance ‘adjacency’ effects; these are also enhanced by the lower concentration of developing agent.

**FX-1 High acutance developer**, speed increase  $\frac{1}{2}$ –1 stop

**Working solution**

Metol	0.5g
Sodium sulphite, anhydrous	5.0g
Sodium carbonate, anhydrous	2.5g
Potassium iodide 0.001% solution	5.0ml
Water to	1000.0 ml

Use once and discard. Do not use Calgon, etc.

**Concentrated stock solutions** (*do not use Calgon, etc*)

<b>A</b>	Metol	5.0g
	Sodium sulphite, anhydrous	50.0g
	Potassium iodide 0.001%	15.0ml
	Water to	1000.0 ml
<b>B</b>	Sodium carbonate, anhydrous	25.0g
	Water to	1000.0 ml

**Making up**

**A** Use water boiled for just 3min then cooled to about 30°C. Dissolve a pinch of the weighed sulphite before the metol. Filter and bottle. This solution will keep a year unopened or until discoloration begins – a light tint can be ignored. If 50ml of the water is replaced by isopropyl alcohol, keeping qualities are improved and precipitation in extreme cold avoided. (See FX-2, Making up, A, and for general observations on making up concentrated liquid developers.) Amber glass bottles are preferable to plastic ones.

**B** Dissolve in water prepared as for A.

The 0.001% solution of potassium iodide can be obtained by dissolving 1g in 1000ml of water; if 100ml of that solution is diluted to 1000ml, then 100ml of this solution again diluted to 1000ml will give a 0.001% solution. This keeps for two years at least.

Working solution – use once and discard.

One part A, one part B, eight parts water. Mix for 2min and allow to stand to ensure homogeneity.

**Single solution concentrate**

Quantities for A and B may be dissolved together in 1000ml of water to form a single solution developer, reject or use when discoloured. 50ml of the water may be replaced by isopropyl alcohol (see making up A above).

**Agitation**

6–8 spiral twists each minute in small tanks up to 300ml capacity, 10–12 in larger ones. (See also notes to FX-2).

**General Notes**

FX-1 demands first-class lenses, precise exposure and no camera movement; also first-class enlarging lenses. Highest resolution and definition will be obtained on Kodak Panatomic-X which will then resolve a B/J classified advertisement page at 7–8ft for a suitable 50mm lens on the 35mm stock or 8–10ft from a suitable 75–80mm lens on the roll film.

**Development times** for FX-1 and FX-2 at 20°C (68°F):

Agfapan 25 (MF)	12min
Agfapan 25 (RF)	13min
Agfapan 100 (RF)	14min
Agfapan 100 (MF)	13min

Ilford Pan-F (MF)	12min
Ilford Pan F (RF)	14min
Ilford FP4 (MF)	13min
Ilford FP4 (RF)	14min
Kodak Pan-X (MF)	13min
Kodak Pan-X (RF)	15min
Kodak Plus-X Pan (MF)	11min
Plus-X Pan Professional	12min
Kodak Verichrome-Pan	14min

Equipment contrast variations are more obvious in nonsolvent developers and these times may need individual adjustment, particularly in FX-2. For future 'Changes in development times', see under that heading in FX series of Fine Grain developers, pages 164–165

**FX-1b\* Acutance Developer**,  $\frac{1}{2}$  stop speed increase

Add to FX-1 working solution (with or without iodide) 40g per litre of anhydrous sodium sulphite. The bare solvent action removes surface flare and image spread. Films faster than ASA160 show a definition and grain disadvantage over normal solvent developers. A 2% acetic acid bath may sometimes be necessary to remove white scum. Times approximately two-thirds FX-1 and 2 (see above)

*\*Formerly numbered FX-13.*

**FX-2 Acutance developer**, 80% speed increase

**Working solution**

Metol	2.5g
Sodium sulphite, anhydrous	3.5g
Glycin	0.75g
Potassium carbonate, crystalline	7.5g
*Pinacryptol Yellow 1:2000 solution	3.5ml
Water to	1000.0ml

*Do not use Calgon, etc*

**Stock solutions** (see making up below)

<b>A</b>	Metol	25.0g
	Sodium sulphite, anhydrous	35.0g
	Glycin	7.5g
	Water to	500.0ml
<b>B</b>	Potassium carbonate (crystals, not dried)	75.0g
	Water to	500.0ml
<b>C</b>	*Pinacryptol Yellow 1:2000 solution	

*\*This dye is available from Brunnings Ltd, 133 High Holborn, London WC1*

**Making up**

Weigh all constituents of A and B and place on plain pieces of paper separately.

**A** In 1400ml of water, boiled for just 3min, then cooled to about 30°C, dissolve a pinch of the sulphite, next the metol, then the rest of the sulphite and add the glycin. If the glycin remains as a yellowy suspension after 3min mixing, add a pinch from the weighed carbonate and restir, repeating the operation if it still fails to dissolve. Alternatively replace 50ml of the water by isopropyl alcohol which will dissolve the glycin. (Isopropyl alcohol is available without licence on order from any chemist quite cheaply. Its addition also improves keeping qualities and prevents precipitation in extreme cold, and it is used for these purposes in some commercial developers.) Make up to 500ml. Filter and store in filled bottles. This solution should keep a year unopened, but should be

rejected when discoloured to a *deep* yellow (glycin developers are usually a golden tint on making up); partly used concentrate should also be rejected when deeply discoloured. Fresh glycin is a reflectant gold yellow in colour. For best keeping, do not aerate whilst mixing and use spotless vessels. Concentrated liquid developers keep indefinitely until oxidation commences, usually from foreign matter in the solution; deterioration then proceeds rapidly once initiated. The use of distilled water is unnecessary; if used, the mixed solution should still be filtered. Do not use Calgon or other sequestering agents in high dilution developers.

**B** Dissolve the crystals (the bulk remaining if any was necessary to dissolve the glycin in *A*) in 400ml water prepared as for *A* and make up to 500ml. This solution maintains activity indefinitely in a full bottle, renew after two months if half used, for consistency.

**C** Keeps indefinitely away from strong light. After two years, however, reject as an increase in activity may occur thereafter. For working solution, take *A* 50ml, *B* 50ml, *C* 3.5ml to make 1 litre developer. Mix well. Use once and discard.

**Development times**

As for FX-1.

**General notes**

If agitation is reduced to every other minute or third minute with an increase in time up to  $\frac{1}{3}$  to  $\frac{1}{2}$ , negatives of interesting internal gradation and acutance may be obtained. Agitation can be abandoned altogether with a further increase in time. Dilution may be doubled or trebled to form stand developers acting over 1–2hr at room temperature. This developer is more ‘pictorial’ than FX-1, which is designed for maximum resolution and definition primarily; FX-2 is far less sensitive to flare, and less demanding on apparatus.

**See also Diluted DK-50**, page T68

**FX-16 (Grain effects on high-speed films)**

This developer has been specially designed to produce an obtrusive grain structure on films of ASA 400 and over, whilst retaining excellent contour sharpness. This retention of sharpness assists in preventing the loss of image quality often found where grain texture has been utilised to give a special effect. The formula is related to the above FX-2 Acutance Developer for slow and medium speed films.

**Working solution**

*50% speed increase*

Metol	0.5g
Glycin	0.5g
Sodium sulphite, anhydrous	4.0g
Sodium carbonate, anhydrous	50.0g
<i>(vide also General Notes)</i>	
†* Pinacryptol Yellow 0.05% solution	250.0ml
Water to	1000.0ml

\*For Kodak Royal-X Pan 350ml/1000ml.

†If unavailable, 0.5g/litre potassium bromide must be substituted to balance the formula, at some sharpness loss but fluffier grain.

**Making up**

Dissolve the solids in half the total quantity of water at around 30°C, 90°F. Add the dye and make up to the total volume. Make up when required. Use within 6hr, adding dye just before use. Use once and discard. Pinacryptol Yellow is available from Brunnings Ltd, 133 High Holborn, London WC1. Pinacryptol Yellow dissolves readily in hot, not quite boiling water. The

0.05% solution – 1:2000 – keeps indefinitely in a brown bottle away from the light: see note *C* to FX-2.

**Development times at 68°F (20°C) in minutes**

**Kodak**

Royal-X Pan	20
Tri-X (RF)	12
Tri-X (MF)	12

**Ilford**

HP5 (RF)	12
HP5 (MF)	10

**Agfa**

1000 (RF)	18
1000 (35mm)	15

**Agitation**

Should be thorough. 10sec/min either spiral or inversion.

**General notes**

The grain pattern texture produced by FX-16 disturbs resolution of fine detail but sharpness of contours and medium detail is enhanced markedly, hence print impact is excellent. FX-16 is primarily intended as a developer for operators wishing to experiment with grain structure for special effects, but it can also be used with advantage as an ‘acutance’ developer for fast films when big enlargements are not required. Texture obtrusiveness can be adjusted by varying the negative area used for enlarging, or using different focal length lenses from the same camera position. With slow and medium speed films there is no gain over FX-2 and ‘acutance’ developers, and contrast difficulties may occur.

If the carbonate is replaced by 50g/litre of sodium metaborate or ‘Kodalk’ a fluffier grain texture is produced. Development times remain the same or slightly shorter.

**GENERAL PURPOSE FORMULAE**

Although Universal formulae (see page 170) can be used for general purpose negative development, this term is usually applied to formulae unsuitable for development of enlarging papers, etc, in which some attempt has been made to obtain contrast control or some particular advantage or negative quality obtainable by the use of a developing agent of special properties. Such developers do not make use of a ‘solvent’ effect, and therefore are not classed as fine-grain developers (see Fine-Grain Developers), as they do not give the minimum graininess possible at a given film-speed. Best control is obtained when such formulae are buffered against changes on alkalinity, for example, D-61A and DK-50. Both these formulae can be used for Kodak Royal-X Pan, the Universal Formulae given earlier may not.

**Ilford General Purpose Negative Developer**

free from organic restrainers

Sodium sulphite, anhydrous	75.0g
Hydroquinone	8.0g
Sodium carbonate, anhydrous	37.5g
Phenidone	0.25g
Potassium bromide	0.5g
Water to	1000.0ml

This concentrated developer is diluted as follows  
*For Dish development of plates and films:* 1 + 2 water  
Developing time: 4min.

For *Tank development*: 1 + 5 water.  
Developing time: 8min.  
*Development temperature*: 20°C, 68°F.

Kodak General Purpose Negative Developers

Dissolve chemicals in this order	D-61A	DK-50
Metol	3.1g	2.5g
Sodium sulphite, anhydrous	90.0g	30.0g
Sodium bisulphite	2.1g	—
Hydroquinone	5.9g	2.5g
Sodium carbonate, anhydrous	11.5g	—
Kodalk (Sodium metaborate)	—	10.0g
Potassium bromide	1.7g	0.5g
Water to	1000.0ml	1000.0ml

These buffered developers are recommended for development of medium to highest speed roll film, sheet film, and plates. D-61A is used in the dish at 1+1 dilution or in tanks at 1+3. Development times for 1+3, between 5 and 10min at 20°C. DK-50 is normally used as recommended by Kodak at full strength. A diluted form of this developer has been proposed independently as giving a useful balance of natural acutance, gradation and speed qualities with controlled contrast rise, this can be made up as follows:

**Diluted DK-50**    Film Speed Normal, good sharpness

Working solution		
Metol		0.5g
Sodium sulphite, anhydrous		6.0g
Hydroquinone		0.5g
Kodalk (sodium metaborate)		2.5g
Potassium bromide		0.125g
Water to		1000.0ml

Stock solutions. Calgon may be used

- A**    Make up DK-50 from the full strength formula on this page or from the packaged powder as directed on the commercial pack.  
**B**    Dissolve 80g Kodalk in 1 litre boiled, cooled water.  
For working solutions use two parts *A*, one part *B*, seven parts water. Use once and discard.

Development times at 68°F (20°C)

Pan F (MF) 6min	Pan-X (RF) 12min
Pan F (RF) 7min	Veripan 13min
FP4 (MF) 8min	HP5 (MF) 10min
FP4 (RF) 9min	HP5 (RF) 12min
Plus-X (MF) 10min	Tri-X (RF) 13min
Plus-X Prof (RF) 11min	Royal-X Pan 15–20min
Pan-X (MF) 10min	Agfa 1000 (MF, RF) 15–20min

MANUFACTURERS SPECIAL FORMULAE

D-19b (Kodak)

A high contrast developer for X-ray and aero films, also useful for general applied photography. Used undiluted at 20°C, the average time for tank development is 5min. Suitable also for photomechanical and document materials. A well-balanced developer of good keeping properties.

D-158 (Kodak)

Recommended by Kodak Ltd, as a developer for photochemical and document copying materials. Dilute 1:1 for use with above materials.

D-163 (Kodak)

Mainly a bromide and chlorobromide paper developer. For papers and lantern plates it is used diluted 1:1, 1:2 or 1:3 according to development speed required, development times being 1½ to 2min at 20°C. Useful also as a negative developer diluted 1:3, giving good contrast and brilliance. Develop 4–6min in a dish and 5–8min in a tank at 20°C.

DK-50 (Kodak)

A normal contrast developer suitable for all types of plates and films but specifically recommended for Royal-X Pan film. Particularly suitable for commercial and engineering subjects. Clean working and fog free, giving excellent gradation on super-speed plates and films. The presence of 'Kodalk' as the alkali prevents hot weather blistering of the emulsion in the acid fixing bath. Use without dilution. 'Kodalk' is sodium metaborate

ID-2 (Ilford)

The standard M-Q developer for films and plates, and a non-caustic developer for high contrast graphic arts films and plates. For normal use dilute 1:2 dish and 1:5 tank. For line and screen work use at stock solution strength.

ID-62 (Ilford)

A general purpose Phenidone-hydroquinone formula for films, plates and papers. For films and plates dilute 1:3 dish and 1:7 tank. For contact papers, contact and special lantern plates dilute 1:1. For enlarging papers dilute 1:3.

ID-20 (Ilford)

A Phenidone-hydroquinone or metol-hydroquinone developer for all types of enlarging papers and specially recommended for Ilford bromide papers. For use when it is diluted 1:3, development time 1½–2min at 20°C. With bromide paper the development time may be reduced to 1–1½min with double strength developer.

*The formula of ID-20 P-Q is not published, the formula below being for ID-20 M-Q.*

Quantities in grams	D-19b	D-158	D-163	DK-50	ID-2	ID-62	ID-20
Metol	2.2	3.2	2.2	2.5	2	—	3
Hydroquinone	8.8	13.3	17	2.5	8	12	12
Phenidone	—	—	—	—	—	0.5	—
Sodium sulphite anhydrous	72	50	75	30	75	50	50
Sodium carbonate anhydrous	48	70	65	—	37	60	60
Kodalk	—	—	—	10	—	—	—
*Ilford IBT Restrainer solution	—	—	—	—	—	20ml	—
Pot bromide	4	1.0	2.8	0.5	2	2	4
Water to 1 litre							

*\*Where Ilford IBT or Johnson 142 is specified throughout the Annual formulae section, the same volume of a solution of 1% benzotriazole dissolved in hot water containing 10% anhydrous sodium carbonate may be substituted: e.g. 1g benzotriazole in 100ml water with 10g carbonate*

# Process Developers

These are used for copying and process materials, graticules, photo-mechanical papers, X-ray development, etc; they are not usually suitable for the development of ordinary general photographic materials.

## Ilford formulae

### Dissolve chemicals in this order

	High contrast	Med. contrast
Sodium sulphite, anhydrous	150.5g	72.0g
Potassium carbonate, anhydrous	100.0g	—
Sodium carbonate, anhydrous	—	50.0g
Hydroquinone	50.0g	8.8g
Phenidone	1.1g	0.22g
Caustic soda	10.0g	
Potassium bromide	16.0g	4.0g
Benzotriazole	1.1g	0.1g
Water to make	1000.0ml	1000.0ml
	Dilute 1:1 for use	Use undiluted

## Medium high contrast hydroquinone caustic developer

### A Stock

Sodium bisulphite or metabisulphite	25.0g
Hydroquinone	25.0g
Potassium bromide	25.0g
Water to	1000.0ml

### B Stock

Caustic soda	45.0g
Water to	1000.0ml

For use mix equal parts of *A* and *B* and develop for 2min at 20°C. Rinse well before acid-fixing to avoid stain or use acid stop bath.

## High contrast single solution hydroquinone-caustic developer Kodak D-8

### Stock Solution

Sodium sulphite, anhydrous	90.0g
Hydroquinone	45.5g
Caustic soda	37.5g
Potassium bromide	30.0g
Water to	1000.0ml

For use take 2 parts stock solution to 1 part water. Develop for 2min at 20°C. This developer keeps for several weeks bottled, and retains its energy for several hours in the open dish. Without loss of density, the caustic soda may be reduced to 28g in which case the stock solution will keep longer still.

# Monobath

### FX-6a (no film speed increase)

Sodium sulphite, anhydrous	50.0g
Hydroquinone	12.0g

Phenidone	1.0g
Sodium hydroxide	10.0g
Sodium thiosulphate	90.0g
Water to	1000.0ml

The bath is adjusted to mean contrast. This can be varied to suit individual materials or conditions by altering the sodium thiosulphate content. Between 70g and 125g/litre this will give a continuously graded softening of contrast; softer results than obtained at 125g/litre are unlikely to be required. For still higher contrast, e.g. with process materials, increase hydroquinone to 15–17g

### Making up

A little Calgon may be used. The bath may be divided into two stock solutions; *A* developing agents and sulphite; *B* sodium thiosulphate. On mixing add 1 pellet of sodium hydroxide per working 30ml. This is quite accurate enough, and may be used whenever making up the bath

### Time

Slow and medium speed films will process in 4min. Normal processing time 5min for all films except Royal-X Pan (6min). Six minutes is the safe time for the bath at all stages. Agitate continuously for ½min on pouring in, then at each minute about 3–5 inversions according to tank size. Wash 5–20min (see general notes below)

### Capacity

Nine to twelve films per litre according to density (over exposure prolongs life). Keep in full containers until *deeply* discoloured. A cloudy deposit should form and can be filtered off if desired. If overworked and film is not fully cleared immerse at once in an acid fixer (logically, a rapid one; such a bath may be temporarily reactivated by adding 15–25g/litre of thiosulphate in an emergency).

# Black and White Reversal

Originally this process\* was used basically for reversal processing of cine film in rapid high output machine processors. Slight modifications have been carried out to make it work with almost all kinds of line and continuous tone materials. The rated emulsion speed can be used as a guide to experimentation, but, in practice, it is found that the speed is doubled. On the other hand the exposure latitude is very small, i.e.  $\pm \frac{1}{4}$  stop with line emulsions.

The recommended first developer is ‘Qualitol’ developer (May & Baker), diluted 1 + 1 with slight modifications; to the developer is added a quantity of 20% of a solution of potassium thiocyanate. A stock solution of this can easily be made by dissolving 200g of potassium thiocyanate in about 750ml of water and making up the solution with water to 1000ml

\*Y.S. Sahota, *British Journal of Photography* 16 May 1975

Water	600ml
‘Qualitol’ developer concentrate	200ml
<i>a</i> for line films: 20% sol potassium thiocyanate	20ml
or	
<i>b</i> for tone films: 20% sol potassium thiocyanate	30ml
Water to make	1000ml

1 Before attempting processing, all the solutions are poured into beakers and the first developer into the developing tank and kept at 20°C. The

exposed film after being loaded into the spiral in total darkness, is put into the developing tank and developed for 2min. The agitation is continuous.

- 2 The film is rinsed in running water for 1 min.
- 3 The rinsed film is transferred to a bleach bath made up as follows:

Water	500ml
Potassium dichromate	10g
Sulphuric acid concentrated	12ml
Water to make	1000ml

The film is bleached in this solution for 1 min.

**N.B.** It is very important always to add the concentrated sulphuric acid to the water very slowly, stirring the solution at the same time. Otherwise the mixture can boil and spit acid.

- 4 The film is rinsed in the running water for 1 min.
- 5 After rinsing it is put into a clearing solution made up of 'Thiolim' – (M & B fixer eliminator) diluted 1 + 9.

Water	500ml
'Thiolim'	100ml
Water to make	1000ml

The film is left in the clearing solution for 1 min.

- 6 The film is again rinsed in running water and room lights are turned on at this stage. The spiral can be taken out of the rinse bath and held about 1 ft away from a darkroom negative viewing box for about 10sec. This is more than sufficient for second exposure. The film is rinsed for 1 min.
- 7 Next, the film is redeveloped in 'Qualitol', diluted 1 + 7, for 2min. For higher contrast the dilution can be 1 + 6.

Water	500ml
'Qualitol' developer concentrate	125ml
Water to make	1000ml

- 8 After this the film is given a quick rinse, and fixed in a high speed fixer, e.g. 'Super Amfix' diluted 1 + 4 for 1min. To the fixer acidified hardener is added to harden the softened emulsion.
- 9 The final rinse in water is of only 3min duration. The total time for the process is only 13min. In actual practice this time can be further reduced by cutting the rinse time in steps 2, 4 and 6 to 30sec, if one has a very efficient water rinse available. It is very important to use continuous agitation throughout the steps. For repeat results it is essential that 'Qualitol' developer is used fresh. As soon as the colour of the concentrated developer changes to pale yellow, it is found that the results are no longer consistent.

# Universal Formulae

The term 'universal' is applied to a formula suitable at various dilutions for the development of a wide range of sensitised materials – sheet films, enlarging and contact printing papers, etc. Used on negative materials, such formulae give rapid processing, but without any refinement of grain; they are therefore unsuited to the processing of miniature 35mm films except the slowest and then well diluted, or of roll films over ASA160 if any real degree of enlargement is required. Their use is not recommended for Kodak Royal-X Pan, which should be developed in DK-50 or D-61a – see page 168.

## Dissolve chemicals in this order

	Ilford Universal P-Q	BJ Universal M-Q
Metol	—	3·2g
Hydroquinone	12·0g	12·5g
Sodium sulphite, anhydrous	50·0g	56·0g
Sodium carbonate, anhydrous	60·0g	63·0g
Phenidone	0·5g	—
Potassium bromide	2·0g	2·0g
Benzotriazole*	0·2g	—
Water to	1000·0ml	1000·0ml

*\*Proprietary concentrated liquid Antifoggants such as Ilford IBT or Kodak Anti-fog 1 may be substituted, about 35ml per stock litre is suitable. See also substitute organic restrainer solution under 'Manufacturers' Formulae for Specific Purposes' table, page 168*

# Print Developers

## FX-12

This formula is recommended when a universal formula is more often to be used for development of printing papers and positive materials of all kinds, since it is balanced to obtain stable image colour over the various grades. Dilutions are: enlarging paper 1 + 3; contact papers 1 + 1; lantern slides 1 + 4; films in tanks 1 + 7. Development times for films will closely resemble those in recommended universal developers at the same dilutions. Warm-tone development of chlorobromides is possible by the usual dilution (e.g 1 + 6) and over-exposure techniques. The chlorquinol should be obtained as fresh as possible – buff-brown not deep brown. For chlorobromide development only, better control latitude may be obtained by adding 15g/litre of potassium or (less readily soluble) sodium citrate. For this purpose, benzotriazole can be reduced by one-third.

Sodium sulphite, anhydrous	60·0g
Hydroquinone	10·0g
Chlorquinol	6·0g
Phenidone	0·5g
Sodium carbonate, anhydrous	60·0g
Potassium bromide	1·5g
Benzotriazole solution*	35·0ml
Water to	1000·0ml

*\*See formula given under 'Manufacturers' Formulae for Specific Purposes' table, page 168.*

# Stop Baths

## Stop Bath 1

Acetic acid glacial or Acetic acid 28% Water to	20ml  75ml 1000ml
--	----------------------------

This bath is recommended for negative development and will remove any surface scum formed. It loses its acid vinegar smell as activity decreases.

## Stop Bath 2

Sodium bisulphite	25ml
Water, to make	1000ml

An efficient and inexpensive bath, an acid smell denotes its acidity is maintained.

## Stop Bath Hardener

Chromic potassium sulphate (chrome alum)	20g
Water to	1000ml

This stop bath has a hardening action and deteriorates in colour from its original purple to green blue as its action is lost. It is used for negative emulsions normally, although it can be used as a final hardener for paper based prints processed at high temperatures.

# Fixers

## 1 Acid Fixing Bath

Sodium thiosulphate crystals ('Hypo')	250g
Sodium bisulphite	20g
Water to	1000ml

This acid fixer is of standard composition and will work as a general purpose bath for all fixing purposes. If the acid smell is lost it can be topped up again with a little bisulphite until it is regained.

## 2 Acid Fixing Bath (Buffered)

Sodium thiosulphate crystals ('Hypo')	250g
Sodium sulphite, anhydrous	25g
Acetic acid glacial	25ml
or	
Acetic acid 28%	80ml
Water to	1000ml

This is a 'buffered' fixing bath which has improved efficiency during use as

a result—it has greater tolerance to carry over of developer

## 3 Buffered Acid Fixer Hardener

Sodium thiosulphate crystals ('Hypo')	300g
Water to	1000ml

Add to the above whilst stirring slowly 250ml of the following stock hardening solution:

Sodium sulphite, anhydrous	75g
Acetic acid glacial	65ml
or	
Acetic acid 28%	235ml
Boric acid (crystals)	50g
Potassium alum	75g
Water to	1000ml

Dissolve these constituents in the order given in half the total quantity of water at about 50°C to dissolve the boric acid quickly—or this can be done separately. Make up with cold water to the total volume

This formula is probably the finest 'Hypo' fixer hardener available—it is fully buffered for a long and efficient working life. It is particularly suitable for the processing of small format films where the operator wishes to use the most careful technique. It is also perfectly suited to the fixing of papers but a simpler formula such as (1) or (2) will fulfil requirements.

## 4 Ammonium Thiosulphate High-Speed Fixer

Ammonium thiosulphate	175g
Sodium sulphite (anhydrous)	25g
Glacial acetic acid (98–100%)	10ml
Boric acid (crystalline)	10g
Water to	1000ml

A high-speed fixer with long working life: if hardening action is required, add 10g per litre of aluminium hydroxychloride after a further 5ml of glacial acetic acid. Fixing time 30–90sec films, 30–60sec papers. For slower action dilute 1 + 1.

# COLOUR FILMS AND PAPERS

This tabulation covers as far as possible from the sources available to us the known types of colour negative and reversal films, and positive and reversal papers throughout the world at mid-1979. This does not imply that all will be available in any given country, and while reasonably complete coverage has been attempted it cannot be guaranteed.

Over the past few years the number of different processes employed has diminished. There are now three main types of colour reversal process in use: Kodak Kodachrome, in which the colour couplers are introduced during layer-by-layer processing, and which is not suitable for user processing; Kodak Ektachrome in which the couplers contained in the emulsion layers are immobilised by water-insoluble resin particles; and Agfa in which the couplers are immobilised by long-chain hydrocarbon residues. The 'Processing' columns of the tables indicate which of the current Kodak and Agfa processes may be used for processing each material: note should also be taken of the additional information under 'Comments'. Where the entry 'Service' appears under 'Processing', the material is usually sold inclusive of processing (but not, necessarily, mounting) and is intended to be returned to the manufacturer's laboratory for processing. Where an alternative to 'Service' is indicated the material may be processed by the user, although of course the processing component of the purchase price is forfeited. Reference should be made to this table before proceeding to the processing formulae and procedures in the later section of the formulary.

Similarly, in the case of colour negative films three processes are in general use: Kodacolor C-22, now superseded for Kodak camera materials by C-41, but still in use for some non-Kodak materials and for a few Kodak laboratory products; Kodak Flexicolor C-41; and the Agfacolor process. The trend is towards C-41 processing. In virtually every case where C-22 material is listed (with the exception of Eastern Bloc countries) this is being replaced by C-41 types. In many cases C-22 and/or Agfacolor-compatible materials are running concurrently with C-41. As a general rule, all ASA400 colour negative materials are of C-41 type but, despite popular belief, not all films with the suffix 'II' are C-41 compatible.

Only a fraction of the house names under which well-known films are sold is listed, since many are transitory or of only local interest, in addition to which many of the larger department stores etc selling material under brand names are unwilling to tie themselves to a single supplier.

The trend with colour slide and sheet reversal films is towards adoption of the E-6 system, but the changeover is slower than with colour negative films.

In the field of colour negative-positive print papers resin-coated materials dominate the market, again following Kodak Ektaprint or Agfacolor processes. The current tendency is for new papers to follow the Ektaprint 2 or 3 method. In addition to those listed, other negative-positive papers are manufactured but are available only to photofinishers: in general the manufacturers do not publicise their existence.

## Colour Reversal Films

Film	Manufacturer/ distributor	Sizes	Speed ASA		Processing	Colour principle	Comments (see p 174)
			Daylight	Tungsten			
Agfachrome 50L Professional	Agfa-Gevaert, West Germany	120, 135, sheet, 35mm bulk	—	50	Agfachrome 41	Agfa	1, 2
Agfachrome 50S Professional	Agfa-Gevaert, West Germany	120, 135, sheet, 35mm bulk, 70mm	50	—	Agfachrome 41	Agfa	2, 3
Agfachrome 64	Honeywell, USA	126, 135	64	—	Service or Agfa (p 174)	Agfa	
Agfachrome Pocket Special	Agfa-Gevaert, West Germany	110	64	—	Service or Agfa (p 174)	Agfa	
Agfacolor CT 18	Agfa-Gevaert, West Germany	120, 127, 135, Rapid	50	—	Service or Agfa (p 174)	Agfa	
Agfacolor CT 21	Agfa-Gevaert, West Germany	135	100	—	Service or Agfa (p 174)	Agfa	
Agfacolor CT-PAK	Agfa-Gevaert, West Germany	126	64	—	Service or Agfa (p 174)	Agfa	
Alfochrome DC21	Ringfoto, West Germany	135	100	—	Service or Agfa (p 174)	Ektachrome	4
Boots Colourslide	Boots, England	135	64	—	Service or E-4	Ektachrome	5
Brilliant High Speed	Neckermann, West Germany	135	100	—	Service or E-4	Ektachrome	4
Brilliant Special	Neckermann, West Germany	135	100	—	Service	Agfa (probably)	6
Brilliant Superchrome	Neckermann, West Germany	135	50	—	Service	Agfa	7

# Colour Reversal Films

Film	Manufacturer/ distributor	Sizes	Speed ASA		Processing	Colour principle	Comments (see p 174)
			Daylight	Tungsten			
Cilchrome	Lumière, France	135	125	—	Service or E-4	Ektachrome	4, 8
Diachrome SL 18	Foto-Porst, West Germany	135	50	—	Service	Agfa	
Diachrome SL 20	Foto-Porst, West Germany	126	80	—	Service or E-4	Ektachrome	4
Diachrome SL 21	Foto-Porst, West Germany	135	100	—	Service or E-4	Ektachrome	4
Ektachrome Duplicating 5038	Kodak	35mm bulk	—	3	E-4 (modified)	Ektachrome	9
Ektachrome MS5256	Kodak	70mm	64	—	E-4	Ektachrome	10
Ektachrome SO-371	Kodak	Sheet	160	—	E-4	Ektachrome	10
Ektachrome SO-375	Kodak	Sheet	—	125	E-4	Ektachrome	10
Ektachrome Infrared	Kodak	135	125	—	E-4	Ektachrome	11
Ektachrome 64	Kodak	110, 120, 126, 127, 135	64	—	E-6	Ektachrome	12
Ektachrome 200	Kodak	135	200	—	E-6	Ektachrome	12
Ektachrome 400	Kodak	120, 135	400	—	E-6	Ektachrome	
Ektachrome 160 Tungsten	Kodak	135	—	160	E-6	Ektachrome	12
Ektachrome 64 Professional	Kodak	120, 135, 220, 70mm	64	—	E-6	Ektachrome	12
Ektachrome 50 Professional	Kodak	120, 135	—	50	E-6	Ektachrome	12
Ektachrome 200 Professional	Kodak	120, 135, 35mm bulk	200	—	E-6	Ektachrome	12
Ektachrome 160 Professional	Kodak	120, 135, 35mm bulk	—	160	E-6	Ektachrome	12
Ektachrome Slide Duplicating Film 5071	Kodak	35mm bulk	—	3	E-6	Ektachrome	12
Ektachrome Duplicating Film 6121	Kodak	Sheet	—	3	E-6	Ektachrome	12
Ektachrome 64 Professional Film 6117	Kodak	Sheet	64	—	E-6	Ektachrome	12
Ektachrome 50 Professional Film 6118	Kodak	Sheet	—	50	E-6	Ektachrome	12
FK Color RD-17	Fotokemika, Yugoslavia	135	40	—	Service or Agfa (p 174)	Agfa	13
Fomachrom D18	Fotochema, CSSR	120, 135	50	—	Service or Agfachrome 41	Agfa	
Fomachrom D20	Fotochema, CSSR	120, 135	80	—	Service or Agfachrome 41	Agfa	
Fomachrom D22	Fotochema, CSSR	120, 135	125	—	Service or Agfachrome 41	Agfa	
Fortechrom	Forte, Hungary	135	50	—	Service or Agfachrome 41	Agfa	
Fujichrome 100 RD	Fuji, Japan	120, 135	100	—	Service or E-6	Ektachrome	
Fujichrome RK	Fuji, Japan	126	100	—	Service or E-4	Ektachrome	10
Fujichrome Professional Type D	Fuji, Japan	120	100	—	E-4 or Fuji CR 55	Ektachrome	3
Gratispool Colour	Gratispool, Britain	126, 135	64	—	Service or E-4	Ektachrome	
Kodachrome 25	Kodak	135	25	—	Service	Kodachrome	
Kodachrome II Type A	Kodak	135	—	40	Service	Kodachrome	
Kodachrome 64	Kodak	110, 126, 135	64	—	Service	Kodachrome	
Kodak Photomicrography Color 2483	Kodak	135	16	—	E-4	Ektachrome	10, 16
Kranzchrome C21	Kranseder, West Germany	135	100	—	Service or E-4	Ektachrome	4
Minochrome	Minox, West Germany	Minox cassette	16	—	Service	Agfa	
Negrachrome 50	Negra, Spain	135	50	—	Service or Agfachrome 41	Agfa	17
Ogachrome	Obergassner, West Germany	135	50	—	Service	Agfa	
Ogachrome High Speed	Obergassner, West Germany	135	100	—	Service or E-4	Kodak	4

# Colour Reversal Films

Film	Manufacturer/ distributor	Sizes	Speed ASA		Processing	Colour principle	Comments <i>(see below)</i>
			Daylight	Tungsten			
Orwochrom UT 18	VEB Filmfabrik Wolfen, East Germany	120, 135, sheet	50	—	Service or ORWO	Agfa	
Orwochrom UT 21	VEB Filmfabrik Wolfen, East Germany	in preparation	100	—	Service or ORWO	Agfa	
Orwochrom UK 17	VEB Filmfabrik Wolfen, East Germany	120, 135, sheet	—	40	Service or ORWO	Agfa	18
Orwochrom Professional Type S	VEB Filmfabrik Wolfen, East Germany	120, sheet	40	—	ORWO 9165	Agfa	3, 19
Peruchrome C 19	Perutz, West Germany	126, 135	64	—	Service or Peruchrome	Agfa	
Prinzcolor Slide Film	Dixons, England	135	100	—	Service or E-4	Ektachrome	20
Revuechrome 3000	Foto-Quelle, West Germany	110, 126, 135	64	—	Service or E-4	Ektachrome	
Sakuracolor R 100	Konishiroku, Japan	120, 126, 135	100	—	Service or E-4	Ektachrome	
Svema-color CO-22D	Svema, USSR	135	25	—	Service	Agfa	
Svema-color CO-32D	Svema, USSR	135	40	—	Service	Agfa	
Svema-color CO-90L	Svema, USSR	135	—	100	Service	Agfa	
Sears Color Slide	Sears, Roebuck, USA	126, 135	64	—	Service or E-4	Ektachrome	
3M Color Slide Film	3M, Italy	110, 126	64	—	Service or E-4	Ektachrome	10
3M Color Slide Film	3M, Italy	135	100	—	Service or E-4	Ektachrome	10
Technicolor Slide	Technicolor, USA	126, 135	64	—	Service	Agfa	
Turachrome	Turaphot, West Germany	135	50	—	Service	Ektachrome	21
Turachrome	Turaphot, West Germany	126	80	—	Service or E-4	Ektachrome	4
Turachrome	Turaphot, West Germany	135	100	—	Service or E-4	Ektachrome	4
Turachrome	Turaphot, West Germany	135	200	—	Service	Ektachrome	21

## Explanatory notes

### Sizes

- 110** 16mm cartridge film for pocket cameras (12 or 20 exp 13 x 17mm).
- 120** Roll film for 12 exp 6 x 6cm (2¼ x 2¼in), 8 exp 6 x 9cm (2¼ x 3¼in) or 15/16 exp 4·5 x 6cm (1¾ x 2¼in).
- 126** 35mm cartridge film for Agfamatic, Instamatic and similar cameras (12 or 20 exp 28 x 28mm).
- 127** Roll film for 8 exp 4 x 6·5cm (1⅝ x 2½in) or 12 exp 4 x 4cm (1⅝ x 1⅝in).
- 135** 35mm film cassette for 12, 20 or 36 exp 24 x 36mm (or correspondingly larger numbers of 24 x 24mm or 18 x 24mm frames).
- 220** Roll film for 24 exp 6 x 6cm (2¼ x 2¼in).
- 620** Roll films equal to size 120 but with a small diameter spool. Not considered in this listing.
- 35mm, 46mm, 70mm** bulk perforated film

### Processing

- Agfachrome 41** Agfachrome Professional Process 41.
- E-3** Kodak Ektachrome Process E-3. Phased out.
- E-4** Kodak Ektachrome Process E-4. Being phased out.
- E-6** Kodak Ektachrome Process E-6.

**Service** Film processed by authorised laboratories.

### Colour principle

- Agfa** Agfacolor principle – i.e. dye couplers immobilised by long-chain hydrocarbon residue to prevent diffusing.
- Ektachrome** Ektachrome principle – i.e. substantive resin-protected dye couplers dispersed in emulsion after being dissolved by solvent with high initial boiling point.
- Kodachrome** Kodachrome principle – i.e. non-substantive dye couplers in processing solutions.

### Comments

- 1** Film balanced for longer exposure times.
- 2** Exact speed is given on the instruction leaflet in film box.
- 3** Film balanced for shorter exposure times.
- 4** Material is identical with Sakuracolor R100 film.
- 5** Former Boots Colourslide II film was Perutz C 18 material. E-6 material in preparation.
- 6** Material is identical with old Sakuracolor R100 film (using Agfacolor principle).

- 7** Material is identical with Orwochrom UT 18, but there is also 3M Color Slide material of the older type (Agfacolor principle) on the market.
- 8** Alternatively a speed of ASA64 or ASA200 is possible by modified processing.
- 9** Low contrast film for slide duplicating, modified E-4 processing.
- 10** New material for Ektachrome Process E-6 now being introduced.
- 11** Infrared sensitised 'false-colour' material (to be exposed with yellow or orange filter).
- 12** Kodak Ektachrome materials for Process E-6 are replacing all E-3 and E-4 materials except Kodak Photomicrography Color Film 2483 and Ektachrome Infrared Film.
- 13** New material for E-4 processing in state of advanced preparation.
- 14** Film is available on Japanese home market only and not identical with Fujichrome material.
- 15** Special material for aerial and underwater photography, not

- sensitised for short (blue) wavelengths
- 16** High-contrast material for technical and scientific photography with high resolving power.
- 17** Material for E-4 processing in preparation probably manufactured by 3M.
- 18** Film has replaced Orwocolor UK 18
- 19** Orwochrom Professional films are only available on the East German home market in small quantities; they have a polyester film base
- 20** Material is identical with 3M Color Slide film (Process E-4) but of lower speed. Old Revuechrome films 18 DIN (manufactured by 3M, Agfacolor principle), 19 DIN (manufactured by GAF, identical with GAF Color Slide 64) and 21 DIN (3M Color Slide ASA 100) are no longer distributed.
- 21** Material is identical with Sakuracolor R100 film and is subjected to modified E-4 processing.

# Colour Reversal Papers

Material	Manufacturer/ distributor	Availability	Surface	Process	Base	Colour principle	Comments (see below)
Agfachrome PE RC	Agfa Gevaert	Sheet, roll	Glossy, Lustre	Agfa 61	Resin coated	Ektachrome	4
Cibachrome – Print CCP–D 182	Ciba-Geigy, Switzerland	Sheet, roll	Glossy	Cibachrome P10	Plastic	Silver-dye bleach	
Cibachrome – A	Ciba-Geigy, Switzerland	Sheet	Glossy	Cibachrome P12	Plastic	Silver-dye bleach	1
Cibachrome – A RC	Ciba-Geigy, Switzerland	Sheet	Lustre	Cibachrome P12	Resin coated	Silver-dye bleach	
Cibachrome – Print 2	Ciba-Geigy, Switzerland	Sheet, roll	Glossy	Cibachrome P18	Plastic	Silver-dye bleach	2
Cibachrome PRC	Ciba-Geigy, Switzerland	Sheet	Lustre	Cibachrome RC	Resin coated	Silver-dye bleach	
Ektachrome 14RC Improved	Kodak, France	Sheet, roll	Glossy, Lustre	Ektaprint R–14	Resin coated	Kodak Ektachrome	
Fuji CB Print	Fuji, Japan	Sheet, roll	Glossy	Cibachrome P10	Plastic	Silver-dye bleach	3
Sakuracolor	Konishiroku, Japan	Sheet, roll	Glossy	Ektaprint R–14	Resin coated	Kodak Ektachrome	
Color Reversal Paper	Photochemical Works No 4, USSR	Sheet	Glossy	6-bath process	Paper	Agfa	

In addition there are papers for special purposes – an example being the Cibachrome copy paper for graphic arts purposes.

## Explanatory notes

### Process

- Agfacolor reversal** Paper Process.
- Cibachrome P10** Cibachrome P10 four-solution silver-dye bleach process.
- Cibachrome P12** New Cibachrome three-solution silver-dye-bleach process (20–28°C) for amateurs.
- Cibachrome P18** New Cibachrome three-solution silver-dye-bleach process (30°C).
- Ektaprint R-5** Ektaprint five-solution reversal process.
- Ektaprint R-14** New Ektaprint three-solution reversal process.

### Colour principle

- Agfa, Kodak** See explanatory notes for colour reversal films, *above*.
- Silver-dye bleach** Layers contain azo dyes which are destroyed during development in areas exposed to light from primary colour transparency, giving direct positive image.

### Comments

- 1** Amateur printing system.
- 2** Cibachrome Process P18 is not to be used for Cibachrome-Transparent development.
- 3** Material manufactured by Ciba-Geigy, Switzerland.
- 4** Compatible with R14.

# Colour 'Instant'- Self Processing - Materials

Film	Manufacturer	Packing and size	Type	Nominal processing time	Speed (index equivalent to ASA)
Kodak Instant Print Film PR-10	Kodak	Film pack (6·7 x 9cm)	Integral single sheet	5min*	150
Polacolor 2, Type 58	Polaroid	Sheet (4 x 5in)	Peel-apart	60sec	75
Polacolor 2, Type 88	Polaroid	Pack (8·2 x 8·6cm)	Peel-apart	60sec	75
Polacolor 2, Type 108	Polaroid	Pack (8·5 x 10·5cm)	Peel-apart	60sec	75
Polacolor 2, Type 668	Polaroid	Pack (8·5 x 10·5cm)	Peel-apart	60sec	75
Polacolor 2, Type 808	Polaroid	Sheet (8 x 10in)	Negative-positive – transfer in special processor	60sec	75
Polaroid SX-70 Land Film	Polaroid	Pack (8 x 8cm)	Integral single sheet	5min*	80

\* 90% of final saturation and density; result can be judged but development continues at an exponentially slowing rate for a considerable time to effective equilibrium.

## Colour Negative Films

Film	Manufacturer/ distributor	Sizes	Speed (ASA)		Processing	Colour principle	Masking principle	Comments (see p 178)
			Daylight	Tungsten				
Agfacolor CNS 2	Agfa-Gevaert, West Germany	110, 120, 126, 127, 135	80	—	Agfacolor	Agfa	Azo dye, bleach bath	1
Agfacolor 80 S	Agfa-Gevaert, West Germany	120, 135, sheet	80	—	Agfacolor	Agfa	Azo dye	2
Agfacolor CNS 400	Agfa-Gevaert, West Germany	110, 135	400	—	C41	Kodak	Azo Dye	
Alfacolor II N 21	Rinfoto dealers, West Germany	110, 126, 135	100	—	C41	Kodak	Azo dyes	3
Berkeycolor	Berkey, USA	126	80	—	Agfacolor	Agfa	Azo dye, bleach bath	4
Boots Colourprint II	Boots, England	126, 135	100	—	C41	Kodak	Azo dyes	17
Brilliant	Neckermann, West Germany	120, 126	100	—	C22	Kodak	Azo dyes	5
Brilliant	Neckermann, West Germany	110, 135	80	—	C41	Kodak	Azo dyes	3, 5
Cilcolor	Lumière, France	110, 126, 135	100	—	C41	Kodak	Azo dyes	3, 6
Directacolor	PIAL, Canada	110	80	—	Agfacolor & C41	Agfa	Azo dye, bleach bath	
Directacolor	PIAL, Canada	126, 135	80	—	Agfacolor & C41	Agfa	Bleach bath	7
Ektacolor ID Copy Film	Kodak	135, sheet	100	—	C22	Kodak	Azo dyes	8
Famous Brand	Pacific Film Laboratories, Australia	126	80	—	Agfacolor	Agfa	Bleach bath	7
FK Color NM 19	Fotokemika, Yugoslavia	120, 135	64	—	C22	Kodak	Azo dyes	9, 10
Fortecolor	Forte, Hungary	120, 135	80	—	Agfacolor	Agfa	Bleach bath	7, 11
Fujicolor F-II 400	Fuji, Japan	110, 135, 120	400	—	C41	Kodak	Azo dyes	
Fujicolor F-II	Fuji, Japan	110, 120, 126, 135	100	—	C41	Kodak	Azo dyes	
Fujicolor Professional Type L	Fuji, Japan	120, sheet	—	50	C22	Kodak	Azo dyes	10, 12
Fujicolor Professional Type S	Fuji, Japan	120, sheet	100	—	C22	Kodak	Azo dyes	2, 10
Gratispool Colour	Gratispool, Great Britain	120, 126, 127, 135	80	—	C22	Kodak	Azo dyes	9, 10
Hanimex-Color CNS 80	Hanimex, Australia	126, 135	80	—	Agfacolor	Agfa	Bleach bath	7

# Colour Negative Films

Films	Manufacturer/ distributor	Sizes	Speed (ASA)		Process	Colour principle	Masking principle	Comments (see p 178)
			Daylight	Tungsten				
Kodacolor II	Kodak	110, 120, 126, 127 135, 828	80		C41	Kodak	Azo dyes	
Kodacolor 400	Kodak	110, 135, 120	400	125	C41	Kodak	Azo dyes	13
Kranzcolor N 21	Kranseder, West Germany	120, 126, 135	100	100	C22	Kodak	Azo dyes	5, 6
Kranzcolor	Kranseder, West Germany	110	125		C41	Kodak	Azo dyes	3
Minocolor 2	Minox, West Germany	Minox cassette	80		C41	Kodak	Azo dyes	14
Negracolor NC 100	Negra, Spain	126, 135	100		C22	Kodak	Azo dyes	5, 6
Ogacolor	Obergassner, West Germany	110, 120, 126, 135	80		C41	Kodak	Azo dyes	6
Orwocolor NC19 MASK	VEB Filmfabrik Wolfen, East Germany	120, 135, sheet	64	50	ORWO 5166 or Agfacolor	Agfa	Azo dyes	
Orwocolor Professional	VEB Filmfabrik Wolfen, East Germany	120	40		ORWO 5166 or Agfacolor	Agfa	Azo dyes	15
Orwocolor Professional Type L	VEB Filmfabrik, Wolfen, East Germany	Sheet		40	ORWO 5160 or Agfacolor	Agfa	Azo dyes	12, 15
Pacific Prestige	Pacific Film Labora- tories, Australia	110	80		Agfacolor	Agfa	Azo dye, bleach bath	4
Pacific Prestige	Pacific Film Labora- tories, Australia	135	80		Agfacolor	Agfa	Bleach bath	7
Perucolor	Perutz, West Germany	110, 126, 135	80		Agfacolor	Agfa	Azo dyes, bleach	4, 16
Porst Color N 21 II	Foto-Porst, West Germany	110, 135	100		C41	Kodak	Azo dyes bath	3, 6
Porst Color N21	Foto-Porst, West Germany	120, 126	100	-	C22	Kodak	Azo dyes	5, 6
Prinzcolor Print	Dixons, England	126, 135	80		C41	Kodak	Azo dyes	9
Revuecolor 3000	Foto-Quelle, West Germany	110, 120, 126, 135	80		C41	Kodak	Azo dyes	9, 17, 18
Sakuracolor 400	Konishiroku, Japan	110, 135, 120	400		C41	Kodak	Azo dyes	
Sakuracolor II	Konishiroku, Japan	135	100		C41	Kodak	Azo dyes	
Sakuracolor II	Konishiroku, Japan	110, 126	80		C41	Kodak	Azo dyes	
Sakuracolor Professional Type L	Konishiroku, Japan	4 x 5 in sheet		32	C22	Kodak	Azo dyes	10, 12
Sakuracolor Professional Type S	Konishiroku, Japan	4 x 5 in sheet, 120	80		C22	Kodak	Azo dyes	2, 10
Sears Color Print	Sears, Roebuck, USA	120, 126, 127, 135	80		Agfacolor	Agfa	Azo dyes bleach bath	4
Svemacolor DS-4	Svema, USSR	120, 135	50		ORWO 5160	Agfa	Non-masked	
Svemacolor DS-5	Svema, USSR	120, 135	40		ORWO 5160	Agfa	Azo dyes	
Svemacolor LN-3	Svema, USSR	120, 135, sheet		40	ORWO 5160	Agfa	Non-masked	
Svemacolor LN-7	Svema, USSR	—not known—		64	not known	Agfa	Azo dyes	
Svemacolor LN-8	Svema, USSR	—not known—		100	not known	Agfa	Azo dyes	
Technicolor Print	Technicolor, USA	126, 135	80		Agfacolor	Agfa	Bleach bath	7
3M Color Print	3M, Italy	110, 126, 135	80		C41	Kodak	Azo dyes	
3M Color Print	3M, Italy	135	400		C41	Kodak	Azo dyes	
TriFCA Colourprint	FCA, England/USA	110, 126, 135	80		C22 (see Comments)	Kodak Agfa	Azo dyes masking bath	19
Turacolor	Turaphot, West Germany	110, 135	100	100	C41	Kodak	Azo dyes	3
Turacolor	Turaphot, West Germany	120	80	80	C22	Kodak	Azo dyes	5, 6

# Colour Negative Films

Films	Manufacturer/ distributor	Sizes	Speed (ASA)		Process	Colour principle	Masking principle	Comments <i>(see below)</i>
			Daylight	Tungsten				
Turacolor	Turaphot, West Germany	126	125	—	C22	Kodak	Azo dyes	5, 6
Valcolor	Valca, Spain	126, 135	100	—	C22	Kodak	Azo dyes	5, 6
Vericolor Commercial Type S	Kodak	120, sheet	100	—	C41	Kodak	Azo dyes	20
Vericolor II Professional Type L	Kodak	120, 135, 220, sheets	—	80	C41	Kodak	Azo dyes	12
Vericolor II Professional Type S	Kodak	120, 135, 220, 35mm, 46mm, 70mm	100	—	C41	Kodak	Azo dyes	2

## Explanatory notes

### Process

**Agfacolor** Agfacolor negative process.

**C22** Kodak colour process C22.

**C41** Kodak colour process C41 with Flexicolor chemicals (bath temperature 100°F).

### Colour principle

**Agfa** Agfacolor principle – i.e. dye couplers are immobilised by long-chain hydrocarbon residue to prevent their diffusing.

**Kodak** Ektachrome principle – i.e. resin-protected dye couplers are dispersed in emulsion after being dissolved by solvent with high initial boiling point.

### Masking principle

**Azo dyes** Coloured couplers with azo compounds used in magenta and cyan layers (Kodak principle).

**Bleach bath** Colour mask(s) formed in bleach bath (by different methods). Dye couplers are colourless.

**Azo dye, bleach bath** Yellow azo mask in magenta layers combined with red mask of the bleach bath type in cyan layer.

### Comments

**1** New CNS 2 material differs from old CNS film by a thinner layer structure with yellow mask integrated in the magenta layers. Due to yellow

azo masking, densities in blue and green are lower and in red higher

**2** Film balanced for shorter exposure times

**3** Material is identical with Sakuracolor II film

**4** Former films were of the bleach bath masking type, i.e. contained a yellow mask of Agfa type and a red mask of Gevaert type

**5** C41 material is in preparation (Sakuracolor II)

**6** Older 120, 126 and 135 size films are identical with Sakuracolor N 100 film (process C22).

**7** New material with yellow azo mask in preparation

**8** Special film for identification and reproduction photography

**9** Former material was identical with 3M Color Print film (process C22).

**10** C41 material in preparation.

**11** Manufactured in co-operation with Agfa-Gevaert

**12** Film balanced for longer exposure times.

**13** Tungsten speed is with 80B filter advised 'for critical use'. Instructions for 110 cartridges claim 'pleasing results' obtainable at automatic indexed ASA 250 without filtration. 135 instruction give recommendations for other illuminants.

**14** Film manufactured by Kodak.

**15** Orwo Professional films are only available on East German home market in small amounts; their film base is polyester

**16** 110.size film is only available in some countries

**17** Material is identical with 3M Color Print film.

**18** Current material in 135 size is still C22 process, to be replaced by C41.

**19** Some TriFCA films are or were manufactured by Ilford Ltd (Mark VI colour film) and not compatible with C22 processing. Also C41 types.

**20** Higher contrast version of Vericolor II Type S

# Colour Print Papers

Paper	Manufacturer/ distributor	Availability	Surface	Process	Base	Colour principle	Comments <i>(see p 179)</i>
Agfacolor MCN 310 Type 4	Agfa-Gevaert, West Germany	Sheet, roll	Glossy, Matt, Silk, Lustre	Agfacolor Process 85	Resin coated	Agfa	1, 10, 11
Ektacolor 78 RC	Kodak	Roll	Glossy, Matt, Silk, Lustre	Ektaprint 3 or 2	Resin coated	Kodak	2, 9
Fomacolor PM 20	Fotochema, CSSR	Sheet, roll	Glossy	ORWO 7362 or Agfacolor Pa	Paper or resin coated	Agfa	3

# Colour Print Papers

Paper	Manufacturer/ distributor	Availability	Surface	Process	Base	Colour principle	Comments (see below)
Fomacolor PM 30	Fotochemia, CSSR	Roll	Glossy	Agfacolor Process 85	Resin coated	Agfa	
Fortecolor CN 4 Type 4	Forte, Hungary	Sheet, roll	Glossy	ORWO 7362 or Agfacolor Pa	Paper or resin coated	Agfa	4
FK Color CN 11 M	Fotokemika, Yugoslavia	Sheet, roll	Glossy	Agfacolor Pa	Paper	Agfa	
Fotocvet F4	Chemical Factory, Leningrad, USSR	Sheet	Glossy	3-bath or 5-bath process	Paper	Agfa	
Fotocvet F5	Chemical Factory Leningrad, USSR	Sheet	Glossy	3-bath or 5-bath process	Paper	Agfa	
Fotoncolor Type 6	Foton, Poland	Sheet	Glossy	Fotoncolor (68°F)	Paper	Agfa	
Fotoncolor Type 7	Foton, Poland	Sheet	Glossy	Fotoncolor (77°F)	Paper	Agfa	5
Fujicolor Type 8907	Fuji, Japan	Sheet, roll	Glossy, Silk	Ektaprint-3	Resin coated	Kodak	12
Labacolor MCN 111-112	Langebartels, West Germany	Sheet	Glossy or Matt	Agfacolor Pa	Paper	Agfa	
Labacolor CPN 317	Langebartels, West Germany	Sheet	Glossy	Ektaprint-3	Resin coated	Kodak	6
Luminos-Color	Luminos, USA	Sheet	Glossy	Agfacolor Pa	Paper	Agfa	7
Mitsubishi KER	Mitsubishi	Sheet, roll	Glossy, Silk	Ektaprint-3	Resin coated	Kodak	12
3M Color RC Paper Type Mk IV	3M, USA	Roll	Glossy, Silk, Matt	Ektaprint-3	Resin coated	Kodak	9
3M High Speed	3M, USA	Sheet, roll	Glossy, Matt, Silk, Lustre	Ektaprint 3 or 2	Resin coated	Kodak	
Oriental Color Q-RC	Oriental, Japan	Roll	Glossy	Oriental P35	Paper or resin coated	Agfa (probably)	8
Sakuracolor PC	Konishiroku, Japan	Sheet, roll	Glossy	Ektaprint-3	Resin coated	Kodak	12
Turacolor CN 11 M PE	Turaphot, West Germany	Sheet, roll	Glossy	Agfacolor Pa	Resin coated	Agfa	
Turacolor CN 17 M PE	Turaphot, West Germany	Sheet, roll	Silk	Agfacolor Pa	Resin coated	Agfa	
Turaprint-3	Turaphot, West Germany	Sheet	Glossy	Ektaprint-3	Resin coated	Kodak	5
Tura Colorleinen	Turaphot, West Germany	Sheet	Textured	Agfacolor Pa	Linen	Agfa	
Valcolor RC 111	Valca, Spain	Sheet, roll	Glossy	Agfacolor Process	Resin coated	Agfa	

## Explanatory notes

### Process

**Agfacolor Pa** Process with Agfacolor 'Pa' chemicals (four solutions; choice of three temperatures, 68°F, 77°F or 86°F respectively).

**Agfacolor 85** Agfacolor Positive Process 85 (three solutions; 95°F).

**Ektaprint-3** Kodak three-solution positive process (86°F).

**Ektaprint-2** Kodak two-solution positive process (86°F): as Ektaprint 3 but with omission of stabiliser.

### Colour principle

See explanatory notes for negative films.

### Comments

**1** Agfacolor MCN 111 Type 4 paper base material for Process 82 is no longer available. Agfacolor MCN 111 Type 7 Paper (Pa process) is also discontinued.

**2** Faster version of former 37RC with changed sensitisation balance. 74RC is earlier version of 78RC.

**3** Fomacolor PM 30 is said to be balanced for Kodacolor II negatives, too.

**4** Fortecolor CN 4 Type 4 resin-coated paper is intended for Agfacolor Process 85.

**5** Fotocolor Type 7 has higher speed than Type 6 and is specially intended for printing Orwocolor NC 19 MASK negatives.

**6** Manufactured by Konishiroku, Japan (Sakuracolor material).

**7** Manufactured by Turaphot, West Germany (Turacolor material).

**8** Available in two gradations on paper base: NCP normal and PCP special.

**9** Code for Kodak and 3M surfaces is Glossy F, Matt N, Silk Y, Lustre E

**10** Code for Agfa surfaces is Glossy O, Semi-matt 2, Silk 7, Filigran lustre 9.

**11** Also Ektaprint-compatible type used in Agfa table-top processors and later generally available.

**12** High-speed version available, usually only in rolls

# COLOUR PROCESSING

## General Instructions

### Storage

The keeping time of used solutions may be diminished by 20–65% depending upon conditions of use and storage (fullness and sealing of bottles, darkness and temperature). Well stoppered dark glass bottles should be used at temperatures not exceeding 20°C. However, first and colour developers should, in any case, be used as fresh as possible. If bleach and fixer are made up as triple-strength stocks, they will be found to have excellent storage properties.

### Temperature

Maintenance of constant temperature throughout first (black-and-white) development in reversal processing and (colour) development in negative processing is absolutely essential if consistent results are to be achieved. In the other solutions, the tolerance is wider, although the specified limits should be respected. Even so, it is important that excessive temperature differences between successive solutions and wash water, especially in transferring to the wash following colour development, be avoided, otherwise there is a risk of reticulation. The washing times given in the procedures apply to temperatures below 20°C; at higher temperatures (22–24°C), they may be shortened without ill effect by 20–30%, thus substantially reducing the overall processing time.

### Colour developing agents

N-Ethyl-N-(β-hydroxyethyl)-*p*-phenylenediamine sulphate = Droxochrome (May & Baker); Activol No 8 (Johnson); T32 (Orwo). N,N-Diethyl-*p*-phenylenediamine hydrochloride = Activol H (Johnson). Colour Developer 1 (chloride) Merck N.  
N-Diethyl-*p*-phenylenediamine sulphate = Colour Developer 1 (sulphate) Merck. More sulphate than hydrochloride will be needed in the ratio 262:200.  
N,N-Diethyl-*p*-phenylenediamine sulphite = Genochrome (May & Baker); Activol No 1 (Johnson); S28 (3M/Ferrania); Fotopur Colour Developer 1 (Merck).  
4-Amino-N-ethyl-N-(β-methanesulphonamidoethyl)-*m*-toluidine sesquisulphate monohydrate = Mydochrome (May & Baker); Activol No 3 (Johnson); Fotopur Colour Developer 3 (Merck); CD3 (Kodak).  
4-Amino-N,N-diethyl-*m*-toluidine hydrochloride = Tolochrome (May & Baker); Fotopur Colour Developer 2 (Merck); CD2 (Kodak).  
N-Ethyl-N-(β-hydroxyethyl)-*p*-toluidine sulphate monohydrate = Fotopur Colour Developer 4 (Merck); CD4 (Kodak).  
4-(N-ω-Sulpho-n-butyl-N-n-butylamino)-aniline = Ac 60 (Agfa – not commercially available).

*This list is retained although some of the chemicals are no longer available under the trade names indicated here, since readers have found it of assistance in tracking them down. The main supplier is Rayco Ltd, Ash Road, Aldershot, Hants. Telephone: 0252 22725.*

### Making up solutions

Difficulties are sometimes encountered in making up colour developing solutions when the developing agent is dissolved in the otherwise

complete solution. With developers containing carbonate, the strongly acid nature of the agent may cause effervescence with loss of carbon dioxide changing the acidity and thus the activity of the resulting solution. Whatever alkali is being used, it is possible for the agent to be released as the free base which floats in oily globules difficult to redissolve. To avoid these effects with any of the solutions given on the following pages, the agent together with the hydroxylamine salt (if any) should be dissolved in half of the water and the remaining ingredients in the other half; the first solution is then poured slowly into the second with continuous stirring. After mixing it is advisable to let the solution stand for four to twenty-four hours before use. In addition, the precautions regarding containers suitable for the mixing of solutions on page 162 of the general instructions for black-and-white processing should be followed carefully.

### Times

All times, including those for washing or rinsing, should be adhered to in order to obviate the possibility of colour casts. The specified treatment times include 10–15sec drainage.

### Agitation

The recommended agitation is indicated immediately after the procedure. It should be adhered to strictly in the developers but in other solutions should be regarded as a minimum: more vigorous agitation can only be advantageous in expediting solution changes in the emulsion.

### Lighting

The individual procedures clearly show at what stage normal room lighting may be resumed when use of an open processing tank necessitates initial darkroom working. At the same stage, the lid of a light-tight tank may be removed.

### Second exposure

The recommended lamp wattage and distance are shown at the appropriate point in the procedure. The film should preferably be removed from the spiral and see-sawed through a dish of cold water below the lamp, front and back being exposed approximately equally. If the exposure is carried out with the film in a transparent-ended spiral, best immersed in cold water in a white bowl, the time should be extended 1½ (35mm) or 2½ (120) times. Care should be taken not to splash the hot lamp with water and not to work near the sink or taps unless the lampholder is properly earthed. Three or four electronic flashes on each side of the film may also be used although this may give odd colour casts with some films.

### Wetting agents

If a final wash completes the procedure, the material should be passed for about 1min through water containing around 1g/l of wetting agents in order to accelerate draining and drying, thereby inhibiting drying marks. The wetting agent may be either of the anionic type – e.g. American Cyanamid Aerosol OT (sodium di-iso-octylsulphosuccinate), Union Carbide Tergitol 7 and Ciba Invitol – or the non-ionic type – e.g. Rohm and Haas Triton X-100, Francolor Sunaptol OP and Union Carbide Tergitol NPX. The wetting agent is conveniently stored as a 10% solution and made up as a 10% solution of this, thus forming a 1% solution. The working strength solution keeps indefinitely but should be discarded after use.

Drying

Should be performed under protection from air currents and dust.

General

The formulae quoted produce results closely corresponding with those from official kits, but deviations occasionally occur owing to variations in reagents from different suppliers. To compensate for these, where necessary, or to provide controls to suit the individual user's taste, the following notes on the less usual ingredients may be helpful:

Citrazinic acid (CZA or 2,6-dihydroxyisonicotinic acid) is employed as a specialised restraining agent and serves to prevent what would otherwise be an excessively dense and contrasty dye image. A deficiency produces a dense greenish image, but an excess produces a thin pinkish image; a 10% change in concentration shows markedly in the result.

Ethylenediamine tetra-acetic acid tetrasodium salt (EDTA Na<sub>4</sub>) acts as an accelerator. A deficiency produces a thin yellowish image, whereas an excess produces a heavy bluish image; a 10% variation is quite noticeable.

Benzyl alcohol acts as a penetrating agent making the otherwise water-proof dye-former particles accessible to the colour developer products. It is particularly important to ensure that this liquid is completely dissolved

Reversal Films

AGFACHROME 50S, AND 50L  
AGFACOLOR CT18, CT21 AND CE20

Agfachrome materials are intended for professional use and are sold without processing rights. Agfacolor reversal materials are of similar type but are intended for amateur use and are sold inclusive of processing; available in the usual formats.

Formulae

First developer (pH: 10.2±0.1)

Calgon	2.0g
Metol	3.0g
Sodium sulphite (anhydrous)	40.0g
Hydroquinone	6.0g
Sodium carbonate (anhydrous)	50.0g
Sodium thiocyanate	1.8g
Potassium bromide	2.0g
Potassium iodide, 0.1% solution	6.0ml
6-nitrobenzimidazole nitrate 0.2% solution* (optional)	20.0ml
Water to	1000.0ml

Stop bath (pH: 5.2±0.2)

Acetic acid 100%	10.0ml
Sodium acetate (3H <sub>2</sub> O)	40.0g
Water to	1000.0ml

Colour developer (pH: 11.8±0.2)

Calgon or sodium tripolyphosphate	2.0g
Sodium sulphite	2.0g
Potassium carbonate (anhydrous)	80.0g
Hydroxylamine sulphate	2.0g
or hydrochloride	2.2g
Ethylenediamine (anhydrous)	8.0g
or 3g/l β-phenylethylamine	
Potassium bromide	2.0g

before any other reagent of the colour developer is added

Variations in the amount of colour developing agent produce effects rather similar to those of the EDTA salt, the balance travelling from thin and warm to dense and cool as the concentration is increased

Precaution

Colour developers contain derivatives of para-phenylenediamine, which in certain persons may produce a form of skin irritation. Persons who are sensitive to chemicals of this kind should take precautions to avoid contact with the developer by using rubber gloves. In all cases, when the skin has been in contact with the solution, it should be rinsed well in clean water, preferably made acid with a few drops of acetic or hydrochloric acid, before using soap. Where processing chemicals are used in premises subject to the provisions of the Health and Safety Act, 1974 (e.g. in professional use or in commercial processing plants) the Act should be consulted for the safety precautions to be observed. In all cases warnings printed on chemical package labels should be strictly complied with. Fuller details of precautions to be observed in the handling of particular materials may be found in the Royal Institute of Chemistry publication, *Hazards in the Chemical Laboratory*, by G. D. Muir.

Add before use:

Droxychrome or Activol X	6.5g
(or the equivalent quantity of a 20% solution)	
Water to	1000.0ml

One may also use as the colour developing agent diethyl para-phenylenediamine sulphate or hydrochloride (Activol 7 or 6) or even Genochrome or Activol No 1 may also be used at 5.0g/litre.

Bleach (pH: 5.4±0.2)

Potassium ferricyanide	80.0g
Potassium bromide	20.0g
Disodium hydrogen orthophosphate (12H <sub>2</sub> O)	26.7g
Sodium or potassium bisulphate	12.0g
Water to	1000.0ml

Fixer (pH: 7.0±7.8)

Sodium thiosulphate (crystalline)	200.0g
Sodium sulphite (anhydrous)	10.0g
Water to	1000.0ml

Ammonium thiosulphate, 120g/litre, may be used to accelerate fixing, replacing the sodium salt.

\* If 6-nitrobenzimidazole is available a 0.2% solution of the nitrate may be prepared by adding 1g to 500ml water previously acidified by the addition of 0.4ml nitric acid. The mixture should be shaken to dissolve the compound.

Procedure

	At 20°C	At 24°C
1 First developer	18–20min 20±0.5°C	13–14min 24±0.25°C
2 Rapid rinse	30sec 16–20°C	30sec 20–24°C
3 Stop bath	4min 18–20°C	3min 22–24°C
4 Wash	10min 16–20°C	7min 20–24°C
5 Re-exposure	500W at 3ft, 1min each side	
6 Colour developer	14min 20±0.5°C	11min 24±0.25°C
7 Wash	20min 16–20°C	14min 20–24°C
8 Bleach	5min 18–20°C	4min 22–24°C
9 Wash	5min 16–20°C	4min 20–24°C

10	Fixer	5min 18–20°C	4min 22–24°C
11	Wash	10min 16–20°C	7min 20–24°C
12	Stabliser and		
13	Wetting agent	1min 16–20°C	1min 20–24°C
14	Dry	Maximum 30°C	
	Total	96½min	70½min

Notes

- A** Recommended agitation is 30sec continuous then two periods of 5sec every minute.
- B** After Stage 5, the processing may be interrupted and the film dried, processing being completed later. In this case, washing should be prolonged to 5min, and the re-exposure to artificial light may be dispensed with. Once dry, the film should be kept in darkness to obviate any possibility of solarisation. If the intermediate drying procedure is followed it is *not* necessary to wet the film before proceeding to Stage 6.

EKTACHROME E-4

Special attention is drawn to the warnings as to the extremely noxious nature of some of the chemicals used in these formulae. Their use should not be attempted by workers unaccustomed to handling such chemicals.

Introduction

The Kodak E-4 process was designed *a priori* for the mechanised processing of Ektachrome materials (EX, EH, Reversal Print, Infrared Aero) with the exception of professional-type films (then processed by the E-3 method), but it may also be used for hand processing, provided scrupulous attention is paid to the times of treatment in the respective baths. These times have been notably shortened in comparison with those of the E-2/E-3 procedures, but this very fact introduces greater risks for the amateur should he fail to observe them meticulously. For current Kodak Ektachrome materials Process E-4 has been superseded by Process E-6.

Process E-4 presents two interesting peculiarities:

- (i) Re-exposure before colour development has been discontinued; reversal is effected by chemical fogging of the emulsion during colour development. This solution contains an organic chemical – TBAB (tertiary-butylaminoborane) – which enables all parts of the emulsion which have not been developed by the black-and-white first developer to react to the colour developer. TBAB is *very toxic* and must be handled with the greatest care to avoid contact with the skin and respiratory organs. It should be noted, however, that in the substitute formula for the colour developer this additive may be dispensed with, provided the film is re-exposed to light in the customary fashion; the colour characteristics of the film are practically unaffected. Chemical reversal with TBAB is also possible when working at 24°C (E-3) but only with Ektachrome EX, EH, and Infrared Aero.
- (ii) To improve the mechanical resistance of emulsions destined for Process E-4 treatment at 29°C, it is necessary to treat them in a preliminary hardening bath containing, in addition to formaldehyde, 2,5-dimethoxy-tetrahydrofuran (DMTF), a liquid whose vapour is very aggressive in its action upon the respiratory system and eyes, and is very rapidly absorbed by the cutaneous tissues. It is therefore essential to avoid any contact with the liquid. Should the skin become contaminated with it, the affected part should be very thoroughly washed for 15min. Should the eyes exhibit symptoms of irritation a doctor should immediately be consulted. So far as formaldehyde is concerned, amateurs will already be familiar with its very active tanning and irritant properties, and we are confident that they will automatically take the utmost precautions against breathing the vapour or allowing the skin to come into contact with the solution.

Formulae	
Pre-hardener (pH: 4.9–5.0)	
6-nitrobenzimidazole nitrate	0.03g
Sodium or potassium bisulphate	0.8g
Tetrahydro-2,5-dimethoxyfuran	5.0ml
Sodium sulphate (anhydrous)	136.0g
Formaldehyde (35–40% solution)	30.0ml
Potassium bromide	3.0g
Water to	1000.0ml

Neutraliser (pH: 5.1–5.2)	
Hydroxylamine sulphate	20.0g
Acetic acid, 100%	10.0ml
Sodium acetate (3H <sub>2</sub> O)	24.0g
Potassium bromide	16.0g
Sodium sulphate (anhydrous)	25.0g
Potassium metabisulphate (crystalline)	5.0g
Sodium hydroxide	6.0g
Water to	1000.0ml

First developer (pH: 10.1–10.3)	
Calgon, sodium hexametaphosphate or tripolyphosphate	2.0g
Metol	6.0g
Sodium sulphite (anhydrous)	50.0g
Sodium carbonate (anhydrous)	30.0g
Hydroquinone	6.0g
Potassium bromide	2.0g
Sodium thiocyanate	1.3g
Sodium hydroxide (pellets)	2.0g
Potassium iodide (0.1% solution)	6.0ml
Water to	1000.0ml

Stop bath (pH: 3.4–3.6)	
Sodium acetate (3H <sub>2</sub> O)	5.3g
Acetic acid (98–100% glacial)	30.0ml
Water to	1000.0ml

Colour developer (pH: 11.8±0.2)	
Calgon or sodium tripolymetaphosphate	2.0g
Trisodium phosphate (12H <sub>2</sub> O)	40.0g
Sodium hydroxide (pellets)	5.0g
1,2-diaminoethane (hydrate)	3.8ml
or ethylenediamine sulphate (crystalline)	7.6g
Benzyl alcohol (35% solution*)	10.0ml
Tertiary butylaminoborane (TBAB)	0.1g
Citrazinic acid	1.3g
EDTA Na <sub>4</sub> , EDTA tetrasodium salt	3.0g
Sodium sulphite (anhydrous)	5.0g
Potassium bromide	1.0g
Potassium iodide (0.1% solution)	20.0ml

Add before use:	
Kodak CD3	11.3g
Water to	1000.0ml

\* **Benzyl alcohol, 35% solution**

Benzyl alcohol	35.0ml
Diethylene glycol (digol)	45.0ml
Water	20.0ml
	100.0ml

**Bleach (also for E3) (pH: 6.6–7.0)**

Potassium ferricyanide	112.0g
Potassium bromide	24.0g
Disodium hydrogen orthophosphate (12H <sub>2</sub> O)	62.0g
Monosodium dihydrogen orthophosphate (anhydrous)	15.6g
Sodium thiocyanate	10.0g
Water to	1000.0ml

**Fixer (also for E3) (pH: 4.5–4.9)**

Ammonium thiosulphate (crystalline)	120.0g
Potassium metabisulphite (crystalline)	20.0g
Water to	1000.0ml

**Stabiliser (also for E3)**

Formaldehyde (35–40% solution)	3.0ml
Wetting agent (10% solution)	10.0ml
Water to	1000.0ml

**Procedure**

<b>1</b>	Preliminary hardener	3min 29.5 ± 0.5°C
<b>2</b>	Neutraliser	1min 28–31°C
<b>3</b>	First developer	6min 29.5 ± 0.25°C
<b>4</b>	First stop bath	2min 28–31°C
	Normal room lighting may be resumed	
<b>5</b>	Wash, running water	4min 27–32°C
<b>6</b>	Colour developer	9min 27–32°C
<b>7</b>	Second stop bath	3min 27–32°C
<b>8</b>	Wash, running water	3min 27–32°C
<b>9</b>	Bleach	5min 27–32°C
<b>10</b>	Fixer	6min 27–32°C
<b>11</b>	Wash, running water	6min 27–32°C
<b>12</b>	Stabiliser	1min 27–32°C
<b>13</b>	Dry	43°C max
	Total	47min

**Notes**

- A** Recommended agitation is continuous for the first 15sec, then 5sec every minute.
- B** Complete transparency of the film is reached only when it is perfectly dry. It should be noted that it is permissible to *dry off the film temporarily* after completion of Stage 5. The film should then be stored in diffused light or preferably in total darkness until processing is to be completed.
- C** The pre-hardener chemicals should be dissolved in water at 38–40°C with continuous agitation until solution is complete. At least 10min must be allowed to elapse before use to allow the DMFT to become transformed by hydrolysis into succinaldehyde, a powerful gelatin tanning agent. The solution becomes effective only after this transformation is complete.
- D** Should it not be possible to obtain the commercial ethylene diamine (1,2-diaminoethane) hydrate (80% ethylene diamine) (beware of noxious fumes) for the colour developer, the sulphate, which is easier to handle, may be used. In this case, the pH-value may need to be adjusted by adding a few millilitres of a 10% solution of caustic soda. The TBAB, supplied by

Kodak Limited in pellet form, should be crushed in a little water, using a glass rod or small pestle, then the remaining solution added. The TBAB can be dispensed with if the usual procedure of reversal by exposure to light is followed (see above). The developer in this form can then also be used for Process E-3.

**E** It should be emphasised that any contamination of one solution by another must absolutely be avoided. As the intermediate washes have been reduced to a strict minimum, all utensils employed in processing must be thoroughly cleansed and dried before used for a succeeding solution

**F** The two stop baths should be kept separate to avoid contamination.

**G** Time of development in the first developer should be increased in accordance with the use it has had. For 20exp 35mm films, or approximately 0.37sq ft material per film, the times should be as follows:

1–4 films	6min
5–7 films	6min 15sec
8–10 films	6min 30sec
11–12 films	6min 50sec

**H** Prolonging or shortening the first development results in the following increases or decreases of effective emulsion speed with E-4 process films:

**Effective emulsion speed (ASA)**

Development Time (min)	Ektachrome-X	High Speed Ektachrome (Daylight)*	High Speed Ektachrome (Tungsten)**
10½	250	640	500
9	160	400	320
8	125	320	250
6 (normal)	64	160	125
4½	32	80	64
3	16	40	32

Also applicable to the equivalent sheet films SO–371\* and SO–375\*\*. For critical work test exposures on the batch of film to be used are recommended. At extreme departures from normal development some slight corrective filtration may be necessary.

**J** This process is also suitable for use with Kodak Photomicrography Color Film PCF 2483 and Ektachrome Slide Duplicating Film 5038. In the latter case a first development time of 4½min is recommended.

**Keeping properties and working capacities**

Solution	Keeping time	Working capacity per litre			
		135–20	135–36	120	sq ft
Pre-hardener	4 weeks	12	7	8	430
Neutraliser	3 months	12	7	8	430
First developer	3 months	12	7	8	430
Colour developer:					
without CD3	6 weeks	—	—	—	—
with CD3	4 weeks	12	7	8	430
Stop baths	6 months	12	7	8	430
Bleach	6 months	18	10	12	650
Fixer	6 months	12	7	8	430
Stabiliser	6 months	should be used fresh			

**OTHER MANUFACTURERS’ MATERIALS COMPATIBLE WITH THE E-4 PROCESS**

As a result of the worldwide dissemination of the Kodak Ektachrome E-4 process, many other manufacturers have produced materials suitable for processing in E-4 solutions. Reference should be made to the tabulations of colour reversal films on pp 172–174. Particular care should be taken to distinguish between E-4 and E-6 process materials.

EKTACHROME E-3

This process is also usable for E-4 materials by Kodak and other manufacturers. Although Kodak E-3 Process materials are no longer manufactured, some users prefer to employ this process for E-4-compatible films.

Formulae

First developer (pH:10.2–10.4)

Phenidone (or metol 6g)	0.5g
Hydroquinone	6.0g
Sodium carbonate (anhydrous)	40.0g
Sodium sulphite (anhydrous)	40.0g
Potassium bromide	2.0g
Sodium thiocyanate	2.0g
Potassium iodide (optional)	0.006g
Nitrobenzimidazole nitrate (0.2% solution) (optional)	15.0ml
Water to	1000.0ml

Hardener-stop bath (pH: 3.5±2.2)

Chrome alum	30.0g
Water (cold) to	1000.0ml

Clearing bath (pH: 4.6±0.2)

Potassium metabisulphite	20.0g
Hydroquinone (optional)	1.0g
Water to	1000.0ml

Bleach (same as for E-4)

Fixer (pH: 4.7±0.2)

Sodium thiosulphate, crystalline	160.0g
or ammonium thiosulphate	120.0g
Potassium metabisulphite	20.0g
Water to	1000.0ml

Colour developer (pH: 11.6±0.1)

Trisodium phosphate (crystalline, 12H <sub>2</sub> O)	40.0g
Caustic soda (pellets)	8.6g
Sodium sulphite (anhydrous)	5.0g
Benzyl alcohol	5.0ml
EDTA Na <sub>4</sub> (tetrasodium salt)	3.0g
Ethylenediamine sulphate	7.5g
Potassium iodide	0.01g
Citrazinic acid (2.6 dihydroxyisonicotinic acid)	1.3g
CD3	10.0ml
Water to	1000.0ml

Stabiliser

Formaldehyde (35–40% solution)	2.0ml
Wetting agent (10% solution)	10.0ml
Water to	1000.0ml

Procedure

1	First developer	10min 24±0.25°C
2	Rinse	$\frac{1}{2}$ –1min 20–26°C
3	Hardener-stop bath	3–10min 20–26°C
	Normal room lighting may be resumed	

4	Wash, running water	3min 20–26°C
5	Re-exposure, No 2 photoflood at 1ft	2 × $\frac{1}{4}$ min
6	Colour developer	15min 20–26°C
7	Wash, running water	5min 20–26°C
8	Clear	5min 20–26°C
9	Rinse, running water	5min 20–26°C
10	Bleach	8min 20–26°C
11	Rinse, running water	1min 20–26°C
12	Fixer	4min 20–26°C
13	Wash, running water	8min 20–26°C
14	Stabiliser	1min 20–26°C
15	Dry	45°C max
	Total	65–72min

Notes

- A** Recommended agitation is 5sec every minute.
- B** After Stage 5, the processing may be interrupted and the film dried, processing being completed later. In this case, washing should be prolonged to 5min, and the re-exposure to artificial light may be dispensed with. Once dry, the film should be kept in darkness to obviate any possibility of solarisation. If the intermediate drying procedure is followed it is *not* necessary to wet the film before proceeding to Stage 6.
- C** The CD3 should be added to the colour developer just before use, as the complete solution does not keep well (at most 15 days in unused condition). A violet coloration will be observed, which disappears after an interval of a few hours and is of no significance. The CD3 may be added either in the form of a powder or a 20% solution, of which the necessary quantity can be added before use with a pipette or measure

ORWOCHROM UT18 AND UT21

Introduction

The procedure is in accordance with the manufacturers' instructions. The working temperature is 25°C, which is much easier to maintain than the traditional 18°C of the old emulsion. The manufacturers have succeeded in sufficiently hardening the emulsion, which formerly had a reputation for being very susceptible to mechanical damage, to allow processing at the higher temperature.

Formulae

Apart from that for the first developer, which makes use of Phenidone, all formulae are as specified by the manufacturers.

First developers

No 1: (pH: 10.2–10.3)

Calgon, sodium hexametaphosphate or tripolyphosphate	2.0g
Sodium sulphite (anhydrous)	40.0g
Sodium carbonate (anhydrous)	34.0g
Phenidone	0.8g
Hydroquinone	6.0g
Potassium bromide	2.5g
Sodium thiocyanate	1.2g
Potassium iodide (0.1% solution)	6.0ml
Water to	1000.0ml

No 2: (pH: 10.3±0.1)

Calgon, sodium hexametaphosphate or tripolyphosphate	2.0g
Sodium sulphite (anhydrous)	40.0g
Sodium metaborate	5.0g

Phenidone	0.8g
Hydroquinone	5.0g
Potassium bromide	2.5g
Sodium thiocyanate	0.8g
Potassium iodide (0.1% solution)	6.0ml
Caustic soda (pellets*)	about 0.8g
Water to	1000.0ml
*To adjust pH to required value	

Stop bath G37 (pH: 4.2±0.1)

Sodium acetate (3H <sub>2</sub> O)	15.0g
Acetic acid (98–100%)	25.0g
Water to	1000.0ml

Bleach bath C57 (reinforced) (ph: 6.2±0.2)

Potassium ferricyanide	100.0g
Potassium bromide	30.0g
Sodium dihydrogen orthophosphate (2H <sub>2</sub> O)	5.8g
Disodium hydrogen orthophosphate (12H <sub>2</sub> O)	4.3g
Water to	1000.0ml

Colour developer C15 (pH: 10.7±0.2)

Calgon, sodium hexametaphosphate or tripolyphosphate	4.0g
Hydroxylamine sulphate	1.2g
Sodium sulphite (anhydrous)	2.0g
Potassium carbonate (anhydrous)	75.0g
6-nitrobenzimidazole nitrate (0.2% solution)	5.5ml
Potassium bromide	2.5g

Add before use:

Diethyl paraphenylenediamine sulphate	3.0g
Water to	100.0ml

Fixer C73 (for quick fixing) (pH: 6.6±0.3)

Sodium thiosulphate (crystalline)	200.0g
Ammonium chloride or sulphate	80.0g
Water to	1000.0ml

Procedure

1	First developer	10min 25±0.25°C
2	Wash, running water	1min 13–24°C
3	Stop bath	2min 18–24°C
	Normal room lighting may be resumed	
4	Re-exposure, 500W at 1m	2 + 2½min
5	Colour developer	12min 25±0.25°C
6	Wash, running water	20min 13–24°C
7	Bleach	5min 18–24°C
8	Wash, running water	5min 13–24°C
9	Fixer	5min 18–24°C
10	Final wash	15min 13–24°C
11	Wet	1min 18–24°C
12	Dry	–30°C max
	Total	81min

Note

A Recommended agitation is continuous for 2min, then 5sec every minute.

Negative Films

AGFACOLOR CNS AND CNS2 (AND PERUCOLOR)

Agfacolor CNS is supplied in the usual ‘amateur sizes’: 120/620, 35mm (20- and 36-exposures and 30m rolls) and 126 cartridges for 12 and 20 exposures. It is balanced for daylight (approximately 5500°K), xenon lamps or electronic flash. If used in tungsten light, the appropriate filters should be employed.

Agfacolor CNS2, introduced originally as Agfacolor Pocket Special for 110-format cameras, is now available in sizes up to and including 120 roll film. *Note* that **Agfacolor CNS400** film is intended for Process AP70 which is equivalent to Kodak C-41.

Construction

Agfacolor CNS has a total emulsion thickness of about 25µm. The order of the coatings, from the base outwards is as follows, ignoring the (colour-less) coatings separating the individual layers:

Base.

Red-sensitive layer (comprising two component layers) in which is formed the cyan dye and the complementary red mask.

Green-sensitive layer; this is actually a multiple coating for it contains, in the lowermost coating, a colour former for the yellow mask, superimposed by two layers in which will be formed the magenta dye.

A layer containing a yellow filter, which disappears in course of processing.

Blue-sensitive layer in which is formed the yellow dye.

The structure of CNS2 is somewhat different. The emulsion thickness is reduced by some 25% to about 19.9µm compared with CNS by altering the make-up of the sensitive layers. The yellow mask layer has been eliminated and replaced by a red filter layer between the magenta and cyan layers. Its purpose is to prevent reflection of green light affecting the green-sensitive, magenta-forming layer, which has been found to have the greatest influence of acutance. The emulsion structure of the blue-sensitive, yellow forming layer has also been changed: the silver halide grain precipitation has been controlled so that the grains are of a specific and uniform size, which reduces irradiation and confers a greater transparency on the yellow layer, with the result that the lower layers record a sharper image. Processing is fully compatible with CNS and earlier Agfacolor negative emulsions.

Mask formation

The two masks are each formed in a special way, which differs from the coloured coupler process employed by, among others, Kodak, 3M, Orwo and Fuji.

The red mask of the cyan layer is formed in the bleach bath by oxidation coupling of the residual coupler (which has not reacted during the colour development) with an auxiliary mask-forming substance incorporated in this layer of the emulsion. (The process is the same as that which characterised the old Gevacolor Mask, where the mask formed was an alkyl derivative of 3- amino-quanidine.)

The yellow mask former (which is actually a slightly yellow-tinted coupler) is transformed into a colourless derivative in those parts of the image where the magenta dye is formed in direct proportion to the amount of magenta dye (by coupling of the oxidation product with the colour former). The residual yellowish coupler is transformed into a definite yellow mask by oxidation in the bleach bath.

Comparative colour rendering and quality

Prints made from a double-masked negative, when compared with those from an unmasked negative, show a very decided improvement in general colour rendering: yellow is more saturated, blue is more luminous, green is

purer and less blue, magenta is more bluish and less intense, red is more saturated and cyan is greener and more luminous. The grain is relatively fine; definition is sufficient easily to permit enlargement of 12–14 diameters (30 × 40cm from a 24 × 36mm negative). The exposure latitude is sufficient to give good-quality images over a range of –1 to +2 stops, equivalent to a range of speed ratings from ASA 20 to 160.

Formulae

Colour developer (pH: 11.0–11.3)

Calgon, sodium hexametaphosphate or tripolyphosphate	2.0g
Hydroxylamine chloride or sulphate	1.4g
Sodium sulphite (anhydrous)	2.0g
Potassium carbonate (anhydrous)	75.0g
Potassium bromide	2.5g

Add, some hours before use:

Diethyl paraphenylenediamine sulphate	2.8g
Water to	1000.0ml

Intermediate bath (pH: 10.2–10.5)

Magnezium sulphate (crystalline)	30.0g
Colour developer (used)	30.0ml
Water to	1000.0ml

Bleach (pH: 5.8–6.2 (critical!))

Potassium ferrocyanide	5.0g
Potassium ferricyanide	20.0g
Potassium bromide	12.0g
Sodium dihydrogen orthophosphate (2H <sub>2</sub> O)	0.9g
Disodium hydrogen orthophosphate (12H <sub>2</sub> O)	2.7g
Water to	1000.0ml

Fixer (pH: 7.0–7.8)

Sodium sulphite (anhydrous)	10.0g
Sodium thiosulphite (crystalline)	200.0g
Water to	1000.0ml

Keeping properties and working capabilities

Solution	Keeping time	Working capacity per litre		
		135–36	120–620	sq ft
Colour developer:				
without diethyl				
ppd	4 months	—	—	—
Complete*	2 weeks	4–5	5	2½
Intermediate bath			should be used fresh	
Bleach	4–6 months	8	10	5
Fixer	4 months	6	8	4
Wetting agent	1 year		should be used fresh	

\* To ensure greater uniformity in negative characteristics, we advise using fresh colour developer every time.

Procedure (as specified by Agfa)

1	Colour developer	8min 20 ± 0.2°C
2	Intermediate bath	4min 20 ± 0.2°C
3	Wash, running water	14min 14–20°C
4	Bleach	6min 20 ± 0.5°C
Normal room lighting may be resumed (actually after 1 min in bleach bath)		

5	Wash, running water	6min 14–20°C
6	Fixer	5min 18–20°C
7	Final wash	10min 14–20°C
8	Wetting agent	½min 14–20°C
Total		52½min

Notes

- A** Recommended agitation is continuous for the first 15sec, then 5sec twice a minute.
- B** Any increase in treatment time or excessive agitation in the bleach (Step 4) may result in the formation of a too dense mask. In our opinion, it is preferable to give 5sec agitation only once a minute in this bath and (from our own experience) to cut the time to 4min.
- C** Depending upon the contrast required, development may be for 7–9min.
- D** Diethyl paraphenylenediamine sulphate has an annoying tendency to form oil droplets of the free base when dissolved in the remainder of the colour developer. It is of advantage to dissolve it separately in 20ml pure water and add this solution with continuous agitation. It is also possible to prepare a 20% stock solution, measuring off the requisite quantity as required:
- |                                       |         |
|---------------------------------------|---------|
| Diethyl paraphenylenediamine sulphate | 20.0g   |
| Potassium metabisulphate              | 2.0g    |
| Water to                              | 100.0ml |
- This solution keeps for 2–3 months in a well-sealed bottle in the dark.
- E** Note CNS 400 requires AP-70 or C-41 process

KODACOLOR C-22 PROCESS

The earlier Kodak camera-use films processed by the C-22 process have been superseded by materials using the C-41 process. The formulae and procedure are retained here since a wide range of non-Kodak materials designed for use with the C-22 process remains current. In addition some Kodak specialist laboratory materials use modified C-22 processing. The question of compatibility of materials intended for C-41 processing with C-22 solutions and *vice versa* was discussed in an article in *The British Journal of Photography* ('C-41 and C-22: the question of compatibility', Neville Maude, p405, 9 May 1975).

Formulae

Colour developer (pH: 10.6–10.7)

Calgon or sodium tripolyphosphate	2.0g
Benzyl alcohol	5.0ml
or benzyl alcohol (solution 35%) (see E-4)	15.0ml
Sodium metaborate (crystalline) or Kodak	85.0g
Sodium sulphite (anhydrous)	2.0g
Potassium bromide	1.6g
CD3	5.3g
Water to	1000.0ml

Stop bath (pH: 4.3–4.7)

Glacial acetic acid	20.0ml
Sodium sulphite (anhydrous)	10.0g
Water to	1000.0ml

Hardener (pH: 10.4–10.8)

Formaldehyde (35–40% solution)	20.0ml
Sodium carbonate (anhydrous)	10.0g
Water to	1000.0ml

**Bleach (pH: 6.6-7.0)** (See also formula for E-3/4 bleach, which acts faster)

Potassium nitrate (crystalline)	25.0g
Potassium ferricyanide	20.0g
Potassium bromide	8.0g
Boric acid	5.0g
Disodium tetraborate	1.0g
Water to	1000.0ml

**Fixer (pH: 4.4-4.6)**

Ammonium thiosulphate (crystalline)	120.0g
Potassium metabisulphite	20.0g
Water to	1000.0ml

**Keeping properties and working capacities**

Solution	Keeping time	Working capacity per litre		
		Roll films 35mm (120 or 620)	35mm (20 exp)	Sheet film 4 x 5in
Colour developer:				
with CD3	2 weeks	6-8	8-10	25
without CD3	6 months	8-10	8-10	25
Stop bath	indefinite	6-8	8-10	25
Hardener	1 year	12-16	16-20	50
Bleach	6 months	16-16	16-20	50
Fixer	6 months	16-16	16-20	50

**Procedure**

The several stages are those specified by Kodak:

1	Colour developer	13min 75±0.5°F
2	Stop bath	4min 68-76°F
3	Hardener	4min 68-76°F
	Normal room lighting may be resumed	
4	Wash	4min 68-76°F
5	Bleach	6min 68-76°F
6	Wash	4min 68-76°F
7	Fixer	8min 68-76°F
8	Final wash	8min 68-76°F
	Total	51min

**Notes**

**A** Recommended agitation is continuous for the first 15sec, then two periods of 5sec every minute.

**B** For electronic flash exposures, it was established that the colour characteristics of the negative are often improved by increasing the development time by 2min to 16min.

**C** Films are transferred from the colour developer direct to the stop bath, taking care to carry as little developer over as possible. However, it was confirmed that a brief rinse (20sec) does no harm and extends the life of the stop bath. The same applies to transferring the film from the stop bath to the hardener.

**D** For sheet films after every three 4 x 5in films the time of development should be increased by 35-45sec. For example:

Film number:	1-3	4-6	7-9	10-12 etc
Minutes:	14	14½	15½	16½ etc

For maximum uniformity of results it is advisable to develop at least 2-9 films together (by the use of suitable dishes) and to use considerable quantities - 5l or more - of solution. In this case an increase of developing time will be necessary only every 12-15 4 x 5in films.

**E** Here, as in all photographic processing, scrupulous cleanliness throughout is essential. Care should be taken to avoid contamination of one solution by another except in the case of the stop bath and hardener, where as officially prescribed by Kodak the film passes straight from the developer into the stop bath and thence into the hardener without any intermediate rinse. It is, however, as well to drain films before immersing them in that solution. It is in fact possible to increase considerably the life of the stop bath and hardener by giving the film a quick rinse (5sec) in water between solutions. For our part we prefer this method which better conforms with our own niceties of practice.

**F** The pH-value of the solutions may be adjusted if need be by varying the buffer proportions (disodium hydrogen orthophosphate, disodium tetrachlorate, boric acid).

**G** It is recommended that the CD3 be added immediately before use; this greatly extends the life of the stock solution. A practical procedure is to make up a 20% stock solution of CD3, the requisite quantity being abstracted with a pipette immediately before use:

Potassium metabisulphite	5.0g
CD3	20.0g
Water (30°C) to	100.0ml

**H** By adjusting the proportion of potassium bromide in the colour developer, contrast can be controlled to an appreciable degree: within limits a higher bromide content increases contrast. It can be reduced to as little as 1g/l, which at the same time gives a gain in emulsion speed of about ½ stop but with the risk of increasing colour fog (depending upon the emulsion).

**I** For roll films and 35mm films the time of development should be increased by 30-45sec for each film developed. Sheet films: the time of development should be increased by 30-45sec for every 5-6, 4 x 5in films.

**OTHER MANUFACTURERS' MATERIALS DESIGNED FOR C-22 PROCESSING**

The following major manufacturers' materials may be processed by the C-22 process:

**Fujicolor N100 and NK**  
**GAF (Ansco) Color Print Film**  
**Sakuracolor N100**  
**3M Color Print Film**

In addition many 'brand-name' films are designed for C-22 processing: Brilliant; FK Color; Inter Color; Kranzcolor N21, N19; Negra Color; Oga Color; Prinz Color; Revue Color; Sears Color; Tura Color; Cornet; Mr Friendlycolor; Valcolor; Twin Pix; David Jones Color; Color Neg Film ASA80; Global CN100; Shell; Ferrania Color Film; Herbert Smalls Extracolor; AA; Certified Color Print; Titan; Palcolor; Extra Spool; Milverson; Paragon; Thrifty Color Neg; Focal; Porst Color; Tele Color; Ring Foto; Revue Color 2000; Trifca Mk VI (FCA); Fotop Colour; Color MN19 (FotoKemika Yugoslavia); Directacolor; Picture Pac Color Picture; Montgomery Ward Color Print ASA80; Berkeycolor Negative Film ASA80; Myercolor GN100; John Martins Color ASA80; Hanimex Vistacolor ASA100; Color Neg Film Cartridge/Kassette ASA64; Boots Color Print.

The following 110-format films are also processed by the Kodak C-22 process: Boots Color Print; Revue Color 2000; Pacific Prestige; Prinz Color; Trifca; Gaf; AA.

**KODACOLOR II AND 400, VERICOLOR II (C-41 PROCESS)**

**Introduction**

There are now two 'amateur' colour negative emulsions supplied by Kodak, Kodacolor II with a speed of ASA100/21 DIN and Kodacolor 400 rated at ASA400/27 DIN. Both are available in 110, 135 and 120 formats. The ASA100 version is additionally available in some of the less used miniature

and roll sizes. In 1979 an improved version of Kodacolor 400 was introduced, first in the USA, the packaging being identified by a red blob. Improvements in granularity and colour differentiation over the earlier material are claimed.

Vericolor II Professional Films Type S (daylight balance, exposures shorter than 1/10sec) and Type L (3200K balance, exposures from 1/50 to 60sec) were introduced in June 1975. The type S material (ASA100) is available in 35mm, 120/220 and 70mm roll formats and in sheet sizes up to 8 x 10in; Type L (ASA25-80, dependent on exposure time) is supplied in 120 roll and in sheet sizes. In 1979 Vericolor Commercial Type S in 120 and sheet formats was introduced. This material has a higher contrast than Type S – in this it resembles Type L – but a similar ASA100 speed rating. The Vericolor II films are claimed to show advantages over Ektacolor Professional films comparable with those of Kodacolor II over Kodacolor X.

As with the earlier C-22 process, many manufacturers now produce materials compatible with C-41 processing. Reference should be made to the tabulation of colour negative films on pp 176–178.

The brevity of the processing steps of the C-41 process may well *a priori* worry the amateur: it is true that it is difficult simultaneously to maintain a high processing temperature together with regular agitation for a time calculated 'to the second', especially in colour development. This is a process intended primarily for automatic processing installations with a view to increasing throughput and profitability. Our experiments have confirmed that the C-41 procedure *can* be carried out efficiently in a small spiral tank – so long, that is, as the time, temperature and agitation recommendations are carried out. One advantage, however, is that the solutions contain only chemicals of weak toxicity: environmentally undesirable substances have been banned from the formulation.

**C-41 Procedure** (after Kodak)

1	Colour development	3min/15sec	37.8 ± 0.15°C
2	Bleach	4min/20sec	38 ± 3.0°C
3	Wash	1min/05sec	38 ± 3.0°C
4	Fix	4min/20sec	38 ± 3.0°C
5	Wash	3min/15sec	38 ± 3.0°C
6	Stabilisation	1min/05sec	24 ± 0.0°C
7	Dry	— <	43°C
	Total	17min/20sec	

**Operational Steps**

- 1 Prepare a water bath at 41°C: this provides a thermal reservoir.
- 2 Bring the solutions up to 38°C before use.
- 3 Fill the developing tank with the necessary quantity of developer, agitate continuously for 20sec, then plunge it in the water bath to within 2–3cm of the top of the lid.
- 4 Take the tank out again and agitate – preferably by inversion – for 5sec. Put it back in the water bath. Repeat this cycle giving 6 agitations each minute.
- 5 Empty the tank 10sec before the elapse of the required time. Shake it well so that as little colour developer as possible is left inside.
- 6 Pour in the bleach and carry out the same agitation rhythm as above.
- 7 When the bleach stage is finished, the tank may be opened to simplify washing.
- 8 Once it has come out of the stabilising bath, the film is hung up to dry in the usual manner. In a normally heated and ventilated room it will be dry in about 30–40min.

**Variations** When processed mechanically, the film is wiped before passing into the bleach bath. When working with a spiral tank this is unfortunately not possible, so that a rapid contamination of the bleach oxidising solution takes place, together with a rise in pH. We have therefore introduced a small variation to overcome this inconvenience: after the end

of colour development, we pour into the tank a stop – 1% acetic acid or the C-22 stop bath – and agitate continuously for 30sec. The solution is then poured out and a 30sec wash in water at 38°C given before pouring in the bleach bath. The Kodak procedure is then resumed. It is also possible to work with the classic ferricyanide bleach bath, using the following procedure:

1	Colour development	3min/15sec	38 ± 0.2°C
2	Stop bath C-22	0min/30sec	38 ± 3.0°C
3	Wash in running water	2min/30sec	38 ± 3.0°C
4	C-22 bleach	2min/30sec	38 ± 3.0°C
5	Wash in running water	1min/30sec	38 ± 3.0°C
6	C-22 fix	4min/20sec	38 ± 3.0°C
7	Wash in running water	3min/15sec	38 ± 3.0°C
8	Stabilisation	1min/05sec	38 ± 3.0°C
9	Drying	— <	43°C
	Total	18min/25sec	

Results with this procedure are identical to those obtained following the official process.

**Formulae**

The quantities are given in grams per litre. The chemicals are dissolved in the indicated order in ca500ml of water at 30–35°C.

**Colour Developer (pH: 10.1–10.2)**

Calgon, sodium tripolyphosphate	2.0g
Sodium sulphite (anhydrous)	2.0g
Sodium bicarbonate	8.0g
Potassium or sodium hydrogen sulphate	7.0g
Potassium bromide	1.8g
Potassium or sodium carbonate (anhydrous)	30.0g
Hydroxylamine sulphate	3.0g
Nitrobenzimidazole-nitrate (0.3% solution)	10.0ml

**Add 6hr before use:**

CD-4	3.2g
or CD-4 (20% solution)	16.0ml
Water to make	1000.0ml

**CD-4 stock solution**

The following keeps well for about 2 months in the cool away from light.	
CD-4	20.0g
Potassium metabisulphite (crystalline)	3.0g
Water to make	100.0ml

**Bleach (pH: 5.9–6.1)**

EDTA NaFe	100.0g
Potassium bromide	50.0g
Ammonia 20%	6.0ml
Water to make	1000.0ml

**Fix (pH: 5.8–6.5)**

Ammonium thiosulphate	120.0g
Sodium sulphite (anhydrous)	20.0g
Potassium metabisulphite (crystalline)	20.0g
Water to make	1000.0ml

**Stabiliser**

Wetting agent (10% solution)	10.0ml
Formaldehyde (35–37% solution)	6.0ml
Water to make	1000.0ml

*Notes* The colour developer can be made up as a concentrated stock

solution. It is diluted just before use and the necessary quantity of CD-4 then added as a solid or from 20% solution:

Calgon or sodium tripolyphosphate	20·0g
Sodium sulphite (anhydrous)	20·0g
Sodium or potassium hydrogen sulphate	70·0g
Potassium carbonate (anhydrous)	300·0g
Hydroxylamine sulphate	30·0g
Potassium bromide	18·0g
Water to make	1000·0ml

In use take 100ml per litre working solution.

Capacity (1 litre) and shelf life of fresh solutions

Solution	Keeping	110/ 20ex	126/ 20ex	Capacity 135 120 36ex	dm <sup>2</sup> approx	
Colour developer without CD-4	6 weeks	—	—	—	—	
Colour developer with CD-4	1 month	30	12	5	6	30
Bleach	8-13 weeks	120	45	20	24	100-120
Fixer	8-12 weeks	60	22	10	12	60
Stabiliser	1 year	use once only			—	
Stop bath	1 year	use once only			—	

Notes

- 1** Partially used solutions have a 30–50% lower shelf life, depending on the actual storage conditions (darkness, well-stoppered bottle, temperature 14–20°C).
- 2** Work whenever possible with fresh solutions to ensure optimum consistency of results. However, for 110 format film, Kodak advise the division of 1 litre of developer into two 500ml quantities. This enables films to be developed in batches of 3, and 5 or 6 batches can be processed before throwing the developer away. If this is done, processing times should be modified according to the following table.

Development time (min/sec)

Film	No of films de-veloped at once	1st batch	2nd	3rd	4th	5th	6th	Total films (on 500ml)
110/12ex	3	3 15	3 22	3 30	3 37	3 45	—	15
110/12ex	3	3 15	3 20	3 26	3 31	3 37	3 43	18

- 3** It is desirable to keep the bleach solution, unlike others, in a half full container. It should be shaken vigorously after use for about 10sec to reoxidise the ferrous complex Fe<sup>++</sup> (formed during bleaching) to the ferric complex Fe<sup>+++</sup>, so that its activity can be maintained. Replenishment is not advisable in amateur usage and the solution should therefore be thrown away after the indicated number of films has been processed.

- NB1** The C-41 colour developer is also suitable for processing Ektacolor 78RC Paper, adding 45ml/l benzyl alcohol.
- NB2** Instead of separate Bleach and Fixing baths, the use of a combined bleach/fix is possible. That given for 78RC paper is suitable (4min): pH 5·8–6·2.

OTHER MAJOR MANUFACTURERS' MATERIALS  
COMPATIBLE WITH C-41 PROCESSING:

Agfacolor CNS-400  
Sakuracolor II and Sakuracolor II 400  
Fujicolor F-II and F-II 400  
Turacolor II  
3M Color Print  
GAF Color Print  
ValcolorII

Colour Print Papers

AGFACOLOR MCN 310/317/319  
TYPE 4 (RC RESIN COATED)

Introduction

The characteristics of these colour papers are adapted to the presence of the masks in Agfacolor CNS. The manufacturers recommend that the paper should if possible be stored at a temperature below 10°C (in a refrigerator) and that the relative humidity should not exceed 60%. In view of the high sensitivity of the paper, it should not be exposed for more than 2min to the light of an Agfa-Gevaert 08 safelight, using a 15W lamp at a minimum distance of 30in.

Formulae

The formulae are as specified by Agfa. The developing agent recommended by the manufacturers is 4-(N-*n*-sulpho-*n*-butyl-N-*n*-butylamino)-aniline (Ac 60). This substance is not commercially available but may be replaced by hydroxyethylethyl paraphenylenediamine (sulphate): the use of one or other of these agents requires slight modification of filter values. Diethyl paraphenylenediamine sulphate is also very suitable and gives results which are close to those obtained with Ac 60, without modification of the developing time.

Colour developer (pH: 10·8–11·0)

Calgon, sodium hexametaphosphate <i>or</i> tripolyphosphate	1·4g
Hydroxylamine sulphate	2·7g
Sodium sulphite (anhydrous)	2·7g
Sodium bromide	0·7g
Potassium carbonate	67·0g

Add, some hours before use:

Ac 60 (Agfa) <i>or</i>	4·0g
T32 <i>or</i> Droxychrome <i>or</i> S5 <i>or</i> diethyl paraphenylenediamine sulphate	3·3g
Water to	2·0g
	1000·0ml

Bleach-fixer (pH: 7·4–7·7)

EDTA Na <sub>4</sub>	25·0g
Disodium tetraborate (crystalline)	30·0g
EDTA NaFe	30·0g
Potassium dihydrogen orthophosphate (anhydrous)	15·0g
Sodium sulphite (anhydrous)	2·0g
Thiosemicarbazide*	3·0g
Sodium thiosulphate (crystalline)	290·0g
Water to	1000·0ml

\* Provided replenishment of solutions is carried out, these two substances may be omitted.

Stabiliser (pH: 6·5–8·0)

Brightening agent	4·0g
Sodium acetate (3H <sub>2</sub> O)	3·0g
EDTA Na <sub>4</sub>	2·0g
Formaldehyde (30% solution)	80·0ml
Water to	1000·0ml

Brightening agents: An industrial product such as:  
Leucophore B, R (Sandoz)  
Blancophore BBU, BUP, BP (Bayer)  
Utivex CF conc, PRS (Ciba)  
Tinopal BV (Geigy)  
Photine C, B (Hickson & Welch)  
Celumyl, B, R, S (Bezons)

Substitute solutions

It is possible to replace the stop-fixer and bleach-fixer solutions by alternative formulae without any sacrifice of quality. These are simpler and therefore easier to prepare, and since they can be used equally well with the majority of current colour papers, this simplification has an obvious advantage.

**Stop bath:** use 2% acetic acid.

Bleach-fixer (pH: 6·7–7·2)

EDTA NaFe	50·0g
EDTA Na <sub>4</sub>	5·0g
Sodium carbonate (anhydrous)	1·0g
Sodium sulphite (anhydrous)	10·0g
Sodium thiocyanate (20% solution)	50·0ml
Potassium iodide	2·0g
Ammonium thiosulphate (crystalline)	120·0g
Water to	1000·0ml

Here again, the use of ammonium thiosulphate enables the time of treatment to be almost halved (3min at 20°C, 2min at 25°C). For the rest, we suggest the following modifications in procedure:

- 1 After colour development, immerse the prints for 10–15sec in a 1% solution of acetic acid instead of rinsing in running water.
- 2 Rinse the prints for 15sec in running water before passing them into the bleach-fixer.

Procedure

Hand processing in dishes	25°C	30°C
1 Colour development	5min	3min
2 Stop (5% acetic acid)	1–2min	1min
3 Rinse	1–2min	1min
4 Bleach-fix	4–5min	3–4min
5 Wash	3–5min	2–3min
6 Stabilise	2min	1min
7 Rinse	½min	½min

Recommended agitation is continuous for the first 15sec in the colour developer then 5sec 3–4 times per minute. In other baths agitation is continuous.

Drum processing *using Simmard or similar small drums*

	30°C	35°C
1 Preheating (water temperature is indicated by Simmard nomogram)	1min	¾min

2 Colour development	3min	2min
3 Stop (5% acetic acid)	¾min	½min
4 Rinse	¾min	½min
5 Bleach-fix	2½min	1½min
6 Wash	2½min	1½min
7 Stabilise	1min	½min
8 Rapid rinse	10sec	5sec

The prints should be dried at temperatures not exceeding 90°C.

Keeping properties and working capacities

Solution	Keeping time	Working capacity	
		per litre 10 × 15cm	sq ft
Colour developer:			
without Ac 60	3 months	—	—
Complete	3–4 weeks	40	6
Bleach-fixer	3–4 months	120	18
Stabiliser	3 months	120	18

OTHER MANUFACTURERS' MATERIALS COMPATIBLE WITH MCN310/4 PROCESSING

The following materials may be processed in the same manner as MCN310/4:

- Fomacolor PM, Type 30 (RC) paper
- Valcolor RC paper (Spain)
- Fortecolor CN4, Type 4 (Resin-coated) Hungary

EKTACOLOR 74RC AND 78RC

Introduction

Colour papers of traditional type, on baryta-coated base, have now been replaced by papers with RC (Resin-coated) base. RC papers were at the outset used for machine printing and marketed only in roll form. They are now being marketed also in standard sheet formats and are available to all users, including amateurs.

The characteristics and some of the claimed advantages of RC papers are: improved mechanical resistance; consequent widening of facility for high temperature processing, with resulting saving of time; very low water absorption – about 15% as compared with baryta papers. (This permits curtailment of washing since the material of the base no longer absorbs chemical solutions which are difficult to remove from the cellulose base and also means quick drying); elimination of the necessity for glazing – RC papers retain their original texture; improved dimensional stability.

Ektacolor 74RC is basically a faster version of the earlier 37RC, the increase in speed being achieved by changing the relative sensitivity of the layers. The blue sensitivity remains virtually unchanged, the green is appreciably increased, while the red-sensitive layer is some 4–5 times faster. Filtration adjustments are thus necessary but processing is as for 37RC. 74RC is being progressively replaced by 78RC for which higher colour saturation and contrast are claimed. Processing characteristics are unchanged.

Procedure

1 Dish processing

The times given below include 20sec for draining at the conclusion of each processing stage.

Solution	Time (minutes)	Temperature (°C)
Colour developer	3½	31·1 ± 0·3
*Bleach fix	1½	31·1 ± 1·2
Wash	2	31·1 ± 1·2
Stabiliser	1	31·1 ± 1·2
Total	8	
Drying		not above 107°C

*\* To obviate an excessive rate of exhaustion of the bleach fix solution due to carry-over contamination, the print may be treated for one minute in a stop bath (for example Stop bath C-33, or a 3% solution of acetic acid) followed by one minute rinse.*

### Clearing

Normal room lighting may be resumed following the bleach fix stage, or even before it, if the stop bath has been used.

### Agitation

If only one print is processed at a time, the dish may be lightly rocked, 3 or 4 times per minute. If a number of prints are processed together, immerse the first print, emulsion side down, then, at 20sec intervals, the second print, the third, and so on, in each case emulsion side down. When all prints are immersed, bring the bottom print to the top, and the others in succession. Continue this procedure until the processing time of each has elapsed.

### Capacity

One litre of colour developer will develop 3 to 4 20 × 25cm prints. It should then be discarded. So far as the other solutions are concerned, they should serve to process (in 1 litre) 7–8 prints of the same format. If the additional stop bath is employed, it is even possible to process at least 1 to 1½m<sup>2</sup> of paper in 1 litre of 'blix'.

### 2 Processing in Simmard or similar small drums

The advantage of this procedure is obvious: the quantity of colour developer used is so very small (60ml for the smallest model, sufficing for development of one 20 × 25cm – 8 × 10in – print); this corresponds to a capacity of 0·8m<sup>2</sup>/litre. For the other solutions the capacity is at least doubled: that is to say, one could use the 60ml twice, or alternatively use four times as much solution (250ml), permitting the consecutive processing of at least 10–12 prints before discarding it. Bearing in mind the cost of chemicals, the economy this represents is obvious, quickly offsetting the initial cost of the drum. This is over and above the immense advantage of being able to work in ordinary light, once the print has been inserted and the drum closed.

Below is a table of procedure for each of three different temperatures from which the most suitable can be chosen to meet local conditions. The directions given for the pre-warming technique which makes use of the tank refer to the Simmard drum.

Solution	Treatment times (min)			Remarks
	t=31°C	33°C	38° ± 0·3	
<b>1</b> Pre-warming/wetting	¾	¾	¾	
<b>2</b> Colour developer	3½	3	2	
<b>3</b> Wash*	¾	¾	½	2 changes
or				
<b>3a</b> Stop bath C-22	½	½	½	
<b>3b</b> Wash*	½	½	½	2 changes
<b>4</b> 'Blix'	1¾	1½	1	
<b>5</b> Wash*	2	1½	1	
<b>6</b> Stabiliser†	1	¾	½	
Total	10	8½	6–6½	

Drying temperature    107°C

*\* Four changes of water may be considered equivalent to one minute of wash*

*† The use of a stabiliser is now optional. The simplified 2-bath process gives equally good results. In this case the final wash must be prolonged to 4, 3 and 2 min. respectively*

### Agitation

About 20–30 cycles/min (according to size of drum). The times given include 10–20sec for emptying the drum. Note that in the case of the large Simmard models (the 30/40 or the 40/50), treatment times should be prolonged by 15sec for the developer and 30sec for the other solutions to allow for the greater quantities of liquid which have to be emptied.

### Temperature

In the case of the Simmard drum this will be determined by reference to the nomograms provided with the drum; this takes account of the ambient temperature (= temperature of solutions) to indicate that of the water for pre-warming and washing. Other small drums including the Paterson and Kodak's own Printank are also supplied with full temperature instructions.

### 3 Processing with the Kodak Rapid Processor Models II and 16K.

Operation	Remarks	°C	Time (mins)
<b>1</b> Preliminary soak	in a dish of water	21–39	½
<b>2</b> Colour development	Safelight No 10	38 ± 0·3	2
<b>3</b> Wash	running water	38 ± 1	½
<b>4</b> Bleach-fix	Normal room lighting	38 ± 1	1
<b>5</b> Wash	running water	38 ± 1	½
<b>6</b> Stabiliser	—	38 ± 1	½
Drying*	—	107	—
<i>Total time:</i> 5min			

The time for each operation includes 10 seconds for draining.

*\* A brief rinse of 3–5sec in water is permissible; this obviates the emission into the atmosphere of fumes of acetic acid, which are both disagreeable and noxious.*

### ALTERNATIVE FORMULAE

The formulae which we give below yield results which are comparable, both qualitatively and quantitatively, with those obtained with the official procedure. Quantities are quoted throughout in grams or millilitres. Where water is the base of a solution, the components should be dissolved in the order indicated in water at 30–35°C.

#### Colour developer†

##### 1 Working solution

Water at 30–35°C	700·0ml
Calgon (sodium tripolyphosphate)	2·0g
Hydroxylamine sulphate	2·0g
Sodium sulphite (anhydrous)	2·0g
Potassium carbonate (anhydrous)	30·0g
Potassium bromide	0·4g
Benzyl alcohol (50% solution)	30·0ml*
Nitrobenzimidazole nitrate	0·2g
(or 3% solution	7·0ml)

##### Add before use:

CD-3	4·4g
(or 22% solution)	20·0ml
Water to	1000·0ml
pH: 10·1    10·2	

*\* See 2 – preparation of concentrated stock solutions*

*† See also Note 1 under C-41 process*

2 Preparation of Concentrated Stock Solutions

Solution A

Benzyl alcohol	500ml	Quantity to be taken per litre of working solution
Diethyleneglycol	500ml	
Total	1000ml	

Solution B

Water at 30 -35°C	700ml	Quantity to be taken per litre of working solution
Calgon	20g	
Hydroxylamine sulphate	20g	
Potassium bromide	4g	
Sodium sulphite (anhydrous)	20g	
Potassium carbonate (anhydrous)	300g	
Nitrobenzimidazole nitrate	0.2g	
Water to	1000ml	

The potassium carbonate should be added slowly in small amounts because of the evolution of CO<sub>2</sub>.

Solution C

Potassium metabisulphite crystalline	2g	Quantity to be taken per litre of working solution
CD-3	22g	
Water to	100ml	

Bleach Fix

1 Working Solution

Water at 30–35°C	700ml	Quantity to be taken per litre of working solution
EDTA NaFe or NH <sub>4</sub> Fe (Merck)	40g	
EDTA Acid	1g	
Potassium iodide	1g	
Ammonia (20% solution)	10ml	
Ammonium thiosulphate (crystalline)	100g	
Sodium sulphite (anhydrous)	2g	
Sodium thiocyanate (20% solution*)	50ml	
Water to	1000ml	

pH: to be adjusted to 6.2–6.5 by the addition of ammonia or acetic acid as necessary.  
\* Ammonium thiocyanate may be used in place of the sodium salt in the same proportion

2 Preparation of Concentrated Stock Solutions

Solution A

Water at 30–35°C	700ml	Quantity to be taken per litre of working solution
EDTA NH <sub>4</sub> Fe	200g	
EDTA Acid	20g	
Ammonia (25% solution)	60ml	
Water to	1000ml	

Solution B

Water at 30–35°C	500ml	Quantity to be taken per litre of working solution
Ammonium thiosulphate (crystalline)	500g	
Sodium (or ammonium) thiocyanate	50g	
Potassium metabisulphite (crystalline)	10g	
Potassium iodide	5g	
Water to	1000ml	

Stabiliser

1 Working Solution

Sodium carbonate (anhydrous)	2.5g	Quantity to be taken per litre of working solution
------------------------------	------	--

Acetic acid (glacial)	12.5ml
Citric acid (crystalline)*	7g
Water to	1000ml
*or tartaric acid	8g
pH: 3.6 ± 0.1	

2 Concentrated Stock Solution

Acetic acid (glacial)	170ml	Quantity to be taken per litre of working solution
Citric acid (crystalline)	95g	
(or tartaric acid)	106g	
Sodium carbonate (anhydrous)	33g	
Water to	1000ml	

Substitutes for CD-3 in the Colour Developer

A number of other colour developing agents currently used in colour laboratories have been examined as possible substitutes for CD-3 in the colour developer. The results obtained with many of them have been excellent and the colour quality has been comparable with that obtained with the original formula with CD-3. The activity of each agent is a function of its chemical structure and account has been taken of this in modifying the concentrations in the colour developer. In addition the effective emulsion speed of the paper is also affected and exposure and activity factors are given based on the use of CD-3 and 4.4g/litre of working solution.

Developing agent	g per litre	pH	Relative activity	Relative exposure
CD-3 Kodak	4.4	10.16	100	1.0
CD-4 Kodak	3.0	10.18	130	0.75
Ethylhydroxyethyl-ppd				
H <sub>2</sub> SO <sub>4</sub>	5.0	10.10	115	0.85
Diethyl-ppd H <sub>2</sub> SO <sub>4</sub>	2.4	10.10	145	0.70
Ac 60 Agfa	4.0	10.7	50	2.0
CD-2 Kodak	2.4	10.2	145	0.70

The filtration required during printing was very similar with all the agents examined. Using a test negative on Ektacolor Professional Film Type S, the values were near 80Y 40M, except with Agfa developing agent Ac60 which required a filtration adjustment to 100Y 60M and a correction of the pH of the solution to 10.6 ± 1.0 by the addition of 0.5 to 1.0g/litre of caustic soda. The findings are summarised in the table.

Notes

All processing may be carried out using the two-bath process. At the concentration given the diethyl-paraphenylenediamine produces a light greenish overall fog. It is necessary to reduce the concentration to 2–2.2g/litre to improve the result.

OTHER MAJOR MANUFACTURERS' MATERIALS  
COMPATIBLE WITH EKTAPRINT 3 PROCESSING

The following materials may be processed in the same manner as Ektacolor 74 and 78RC papers:

**Fujicolor** Paper, RC  
**Sakuracolor** Paper, RC Type QII  
**3M Color Paper**, RC

Reference should also be made to the tabulation of colour print papers on pp 178–179.

# Reversal Papers

## CIBACHROME PRINT TYPE D182

### Historical introduction

The practical realisation of a system of positive-positive colour reproduction by the silver dye bleach process, i.e. the image-wise selective destruction of dyes, has remained just short of achievement for many years, indeed for decades.

It was only in 1963 that Ciba (actually Ciba-Geigy Photochimie) at Basel and Fribourg, Switzerland, following several years of fundamental research in this field, presented the professional with the 'Cilchrome Print'.

Twelve years later, the Cibachrome Print, as it is now called, entered the domain of colour reproduction, thanks to its characteristics which place it among the most interesting photochemical products of the present era.

The Cibachrome Print is in fact the only positive-positive colour material, which enables a transparency to be duplicated direct, i.e. without the need for reversal of a black-and-white negative image and subsequent colour development.

### The characteristics of Cibachrome

In the traditional procedure for colour reproduction (colour development), the dyes which ultimately form the colour image are produced during development by reaction between the dye couplers incorporated in the emulsions and the oxidation products of the developing agent, the dye formation being linked with the formulation of the silver image. The Cibachrome process, on the contrary, is based upon the selective destruction of dyes already present in the emulsion. In a way it is a sort of inversion of the traditional procedure.

The dyes formed by colour development are azomethines or quinonemethines, and have only limited stability to external influences: light, humidity, and vapours, oxidisers and reducers. There is only a relatively restricted choice, since only a few developing agents can be thus used in practice: diethylparaphenylene diamine and its homologues, CD-2, CD-3, CD-4, Ac60. Against this, the mechanism of development of the Cibachrome print permits a choice of dyes offering the maximum of favourable characteristics: a high degree of chemical purity in the dye; resistance to chemical agents during and after processing; very great stability to light; non-diffusibility; a very selective absorption for each dye; great purity of hue; the complete elimination of products of destruction without affecting the colour of the print or the purity of the whites; proportionality between destruction of dye and metallic silver of the image. The dye also has no detrimental effect on the sensitometric characteristics of the emulsion.

The dyes used in the Cibachrome Print are the polyazos (combining the maximum of properties required by the process), derivatives or parents of the most stable dyes used in the textile industry.

In consequence of the presence of the subtractive colours yellow, magenta, and cyan in the unexposed emulsion, this is very dark in colour; one result of this is an appreciable reduction in effective sensitivity, a drawback which in the material ultimately available, CCP-D182, has been very largely overcome. The actual speed is about equivalent to half (one stop less than) that of the fastest traditional papers. As against this, this coloration of the emulsion spectacularly diminishes irradiation or diffusion of light in the emulsion at the time of exposure, and this greatly increases the resolving power, which averages 50 lines/mm. Another advantage inherent in the paper is the non-existence of coloured grain in the emulsion, as is characteristic of dyes formed by chromogenic reaction. The only grain to be seen on the finished print is that already existing in the original transparency, which is reproduced in the Cibachrome print.

The chemistry of the process precludes the use of a baryta based paper. The Cibachrome print base is cellulose triacetate with matt back surface to

permit annotation in pencil, or ball point or felt tip pen. A coating of titanium dioxide ensures excellent opacity and very high reflecting power

### Construction of the Cibachrome Print

The opaque base is coated with three emulsion layers; from the base upwards these are: red sensitive layer, containing a cyan dye; green sensitive layer, containing a magenta dye; a non-sensitised yellow filter layer, which bleaches out in processing; a non-colour sensitised emulsion sensitive to blue, containing a yellow dye.

### P-10 PROCESS

#### Order of procedure

Still in use today, this procedure comprises four solutions:

- 1 Black-and-white developer** of traditional PQ type.
- 2 Dye-bleach:** this solution, which is strongly acid (pH 0.8) contains, besides an alkaline halide and a stabiliser, a catalyst for dye reduction. The dye is reduced in direct proportion to the metallic silver produced during the black-and-white development. The dye is, thus eliminated from the non coloured areas while remaining present in those parts of the image which are coloured.
- 3 Silver bleach:** The metallic silver is rehalogenised in a traditional bleach (based on potassium ferricyanide).
- 4 Fixer:** The print is fixed in a traditional fixing bath (ammonium thiosulphate).

The resulting print reproduces the original transparency in true colour rendering. Colour casts are eliminated in printing on the subtractive principle, by adjusting the spectral composition of the printing light by reducing the density of the filter (or filters) of the same colour as the colour cast or adding a complementary one.

### Requirements for Process P-10

This process is employed also for processing **Cibachrome transparent Type D** (CCT-D 661), giving copies for viewing by transmitted light (transparencies). The only difference lies in some modification of the time of treatment in the solutions and some increase in degree of replenishment. The chemicals for P-10 are supplied in packings to make 30 litres of solution. Kits of replenishers are available for 19 and 95 litres. Making up the solutions presents no special problems, except that the high acidity of compound C of the dye destruction solution is extremely corrosive and can be dangerous if brought into contact with the skin, the mucous membranes, or clothing. On this account special precautions should be taken: plastic or rubber gloves, protective glasses, and an apron. The use of the other products calls only for normal precautions.

Process P-10 is designed for use by professionals having access to automatic or semi-automatic processing equipment either with replenishment or using the total loss process. Processing is described in minute detail in the technical brochure No 22 issued by Ciba-Geigy Photochimie, while No 23 gives full details of the characteristics and use of CCP-D 182. Much of the content of the present article is derived from these publications.

Here, as in the negative-positive process, strict adherence to times and temperatures, not to mention the utmost cleanliness, is essential. There must be no contamination of any one solution by another. However, the various stages are not critical apart from that of dye destruction, where time, agitation and temperature must be scrupulously observed. The entire success of the process depends upon this operation

### Equipment

An ordinary enlarger may be used, provided its illumination is adequate. It should be possible to produce a 20 × 25cm enlargement from a 24 × 36mm

transparency with an exposure of between 10 and 40sec at f/5·6. A suitable safelight is an Ilford GB-908 or Agfa-Gevaert G4 using a 15W bulb at a minimum distance of 80cm. The Kodak Series 3 safelight can also be used, as an indirect source. Personally, the writer prefers to work in total darkness. For colour balance, the usual subtractive filters are employed, with the addition of a (Kodak Wratten 2B) ultraviolet filter. It stands to reason that a dichroic filter head makes working easier and more precise.

The functioning of CCP-D182

In common with all photochemical materials, Cibachrome is subject to reciprocity failure. The diagram below enables the correct exposures to be determined from the uncorrected meter reading. A small adjustment of filter values is also necessary to compensate for deviation in colour sensitivity balance consequent upon changes in exposure time. Usually, the correction remains within limits of ±0·05 filter units for yellow and cyan taking account of the variations in density from one transparency to another. The stability of the latent image is much superior to that of traditional material. It is safe to process prints within 6–8 hours of exposure even if they are kept at room temperature. So far as unexposed paper is concerned, this keeps as well as a black-and-white material. However, the use of a refrigerator cannot but help in maintaining its good properties for many months.

The total loss process for rotating drums:

Processing stage	Duration (min)	Temp* (°C)
Developer DE	6	24 ± 1
Wash	4	24 ± 1
Dye bleach FB	7½	24 ± ¼
Wash	2	24 ± 1
Silver bleach BA	2	24 ± 1
Wash	1	24 ± 1
Fixer FX	8	24 ± 1
Final wash	6	24 ± 1
Total		36½

\*Nominally 24°C: it is possible to process at 30°C, but Ciba-Geigy Photochimie do not recommend it.

If need be, the process can be used for small-scale production in a Simmard or similar tank (using a motor to ensure uniform action in the various solutions, especially at the dye-destruction stage which is the crucial stage of the process).

P-10 Formulae

The catalyst used by Ciba-Geigy in the dye destruction bath FB has not been disclosed but patents have mentioned in examples Phenazine and Quinoxaline derivatives at very low concentrations, 4–100mg/l, see special note below.

Black-and-white developer DE	g/litre
Calgon, sodium tripolyphosphate	2·0
Phenidone	0·3
Sodium sulphite (anhydrous)	50·0
Potassium bromide	1·2
Borax (crystalline) (10H <sub>2</sub> O)	15·0
Sodium metaborate (crystalline) (4H <sub>2</sub> O)	15·0
Hydroquinone	6·0
Benzotriazole	0·05
Water to	1000·0ml
<i>pH: 9·7 ± 0·05 adjust as needed.</i>	

Dye destruction FB (see note below)	g/litre
Amidosulphonic acid (sulphamic acid)	60·0

Ascorbic acid	1·0
Potassium iodide	25·0
Catalyser solution	7·0ml
Water to	1000·0ml
<i>pH 0·8 ± 0·05</i>	

**Note** In place of the Dye destruction Bath FB given above the following has been suggested

Water at 27°	800·0ml
Sodium bisulphate	14·5g
Sodium chloride	6·0g
Ascorbic acid	0·5g
Potassium iodide	16·5g
Catalyst solution	9·5ml
Water to	1000·0ml

Catalyst solution:	
2, 3-Dimethylquinoxaline*	1·0g
70% aqueous isopropanol	100·0ml

\* Aldrich Chemical Co Ltd, The Old Brickyard, New Road, Gillingham, Dorset SP8 4JL.

Silver bleach BA

Potassium ferricyanide	60·0
Potassium bromide	15·0
Monosodium phosphate (or monopotassium) (anhydrous)	18–20·0
Acetic acid 100%	10·0ml
Disodium phosphate (7H <sub>2</sub> O)	10·0
Water to	1000·0ml
<i>pH: 4·2 ± 0·1 adjust as needed.</i>	

Fixer FX

Ammonium thiosulphate (crystalline)	120·0
Sodium sulphite (anhydrous)	10·0
Potassium metabisulphite (crystalline)	10–12·0
Water to	1000·0ml
<i>pH: 6·2 ± 0·1 adjust as needed.</i>	

**Note: In place of the separate bleach and fix we have experimented with success with a bleach-fix solution (‘blix’) prepared according to the following formula:**

	g/litre
Sequestrene NaFe (Ciba-Geigy)	60·0
EDTA acid	6·0
Ammonium 20% solution	16·0ml
Sodium, potassium, or ammonium thiocyanate (it is advisable to use a 20% stock solution)	10·0
Sodium sulphite (anhydrous)	3·0
Ammonium thiosulphate (crystalline)	120·0
Water to	1000·0ml
<i>pH: 6·5–6·7 adjust as needed.</i>	

Treatment time:

at 24° C	4min 30sec
at 32°	3min 30sec
at 36°	3min

Working capacity: about 1m<sup>2</sup>/litre  
Keeping quality: 8–10 weeks

P-18 PROCESS

Introduction

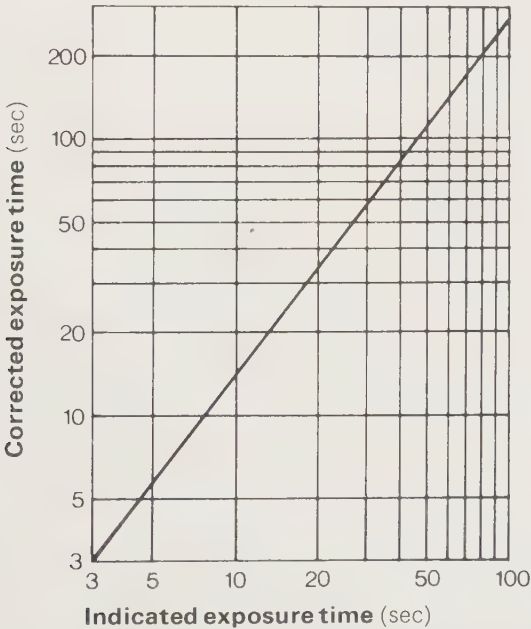
The demands of productivity and competition impose upon research and practice alike continued effort towards perfection in working methods. Furthermore, ecological problems (especially water pollution) place on manufacturers an obligation to renounce the use of toxic substances such as potassium ferricyanide, which has hitherto been a recognised constituent of all silver bleach baths except where potassium dichromate was used, and this in any case is very corrosive in acid solution. With this in view, Ciba-Geigy Photochimie have developed a new process for CCP-D 182, under the designation Process P-18, which we describe below.

Description of the process

It is characterised by the use of only three solutions:

- 1 black-and-white developer
- 2 combined bleach (dye and metallic silver)
- 3 fixer.

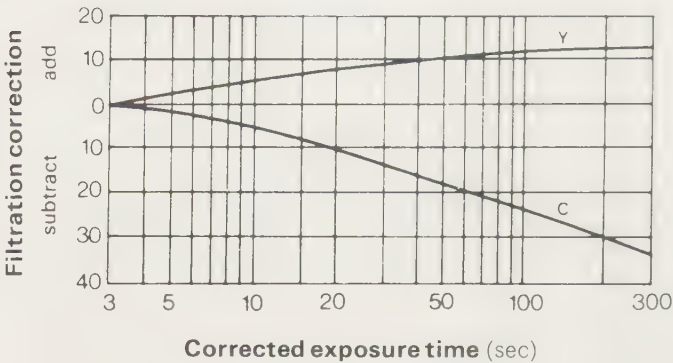
This simplification of procedure from 4 to 3 baths permits a very appreciable reduction in the processing time without detriment to the excellent characteristics of CCP-D 182. The separate silver bleach has been abandoned, this operation being now carried out simultaneously with the selective dye destruction: the bleach bath combines the reduction of the dye with the oxidation of the metallic agent. The first reaction is brought about through the presence of the catalyser which is the main feature of the process, even though the rehalogenisation of the residual silver takes place chiefly by the action of an organic derivative of great oxidising power.



Correction for reciprocity failure applicable at long exposure times

The quasi-simultaneity of the two phenomena has the advantage of rendering the phase of dye destruction less critical. The effect of exceeding the correct treatment time in this bath is no more than a possible degradation of the image: the metallic silver whose presence is necessary for the dye reduction returns completely to the state of oxidation which existed before development (silver halide), and as such can no longer incite the reduction of the dye and so weaken the image.

Filtration correction necessary with increasing exposure



The *developer*, like that of process P-10, is based in the phenidone-hydroquinone combination. It contains certain additions, including a visual blueing agent.

The controlled *bleach* bath, the action of which we have explained above, contains about 4% of sulphuric acid and its pH is very low (0.4). Its preparation from concentrated solutions calls for stringent precautions: in this case against damage to clothing, eyes, and hands. The fixer is based on strongly buffered ammonium thiosulphate, and its pH is close to neutral.

Making up the solution

The chemicals of Process P-18 are supplied in the form of liquid concentrates. This renders it easier to make up small quantities, and permits the day-to-day preparation of just that quantity which is expected to be needed.

Working quantities are as follows:

Developer	DE 18-25 for 25 litres
Developer replenisher	DER 18-50 for 50 litres
Bleach	BL 18-25 for 25 litres
Bleach replenisher	BLR 18-50 for 50 litres
Fixer	FX 18-25 for 25 litres
Fixer replenisher	FXR 18-50 for 50 litres

Apart from the fixer and its replenisher, each of which is itself a concentrated liquid, each of the other baths comprises two constituents (A and B) which have to be mixed and diluted.

Procedure

The treatment times in the three baths DE, BL and FX remain the same whatever the processing equipment used for process P-18. The only difference lies in the degree of replenishment (disregarding, of course, the total loss process) and the duration of intermediate rinses. All these are specified in the Technical Brochure No 25 'Cibachrome Process P-18', published in March 1975,

Below we give the schedule of procedure for the total loss process with revolving drum equipment:

Processing stage	Duration (min)	Temp (°C)
Preliminary soak	1-4	28-32
Development DE-18	3	30 ± 0.5
Wash	1	28-32

Bleach BL–18	3	30±1
Wash	1	28 – 32
Fixing FX–18	3	30±1
Final wash	4½	28 – 32
Drying	16½–19½	< 70

Here, too, the Simmard or other drum can be used, for small scale production. The effective intermediate washing time (contact with water) should be not less than 45sec. It can safely be prolonged to 1½min. Since development continues during the washing stage which follows it, it is important not to vary the duration of this wash (the third stage) from one batch of prints to another, if constant and comparable results are to be obtained.

### Conclusions, general remarks

Process P–18 offers numerous practical advantages: 3 baths instead of 4; reduction of total processing time by nearly 50%; elimination of a toxic working solution and of an environmentally toxic substance (potassium ferricyanide as silver bleach); liquid stock solutions for easy breakdown; large temperature tolerance in the washing stages (4°C instead of 2°C); bleaching not critical, with an increased temperature tolerance (2°C against ½°C). All these advantages have been gained without detriment to the characteristics of the emulsion: exposure latitude, simplicity of filtration, stability of image.

The sole inconvenience: Process P–18 is not compatible with the Cibachrome Transparent CCT–D 661 which must be processed by the P–10 process (above). The professional, therefore, using both products must continue to use Process P–10 if he wishes to work with the same solutions and the same equipment.

Using P–10 for the one and P–18 for the other, he will obtain prints which are of a quality so far unequalled, by a long way, by anything on the market from the point of view of: simplicity and versatility of processing; saturation and purity of colour; permanence of image; exposure latitude; simplicity of filtration; image definition; and absence of grain in the material.

### CORRECTION OF COLOUR RENDERING

It is possible to correct colour rendering of prints,which, for one reason or another, may show a colour cast; for this, solutions are used which possess properties of selective dye destruction.

The retouching solution may be applied either locally, by means of a brush or a small pad, or generally, by total immersion of the print. It is advisable to wear rubber gloves and protective glasses, since these solutions are toxic and corrosive.

#### Selective destruction of yellow :

Dimethylformamide	1·75parts
Water	1·00parts

The solution will keep for several months.

Do not wet the print before treatment.

Temperature 22–23°C.

After 8min, about 80% of the dye will have been eliminated.

Wash for 10min and dry.

#### Selective destruction of magenta :

Chloramine-T	15g
Water	1000ml

The solution keeps for several months.

Use only the quantity of solution actually necesssary, and before use add 10% acetic acid drop by drop until the solution begins to appear milky.

Rinse for 30sec and treat for 2min in a 1% solution of sodium bisulphite, wash 10min, and dry.

Should the whites show a tendency to yellow as a result of the treatment,

this can be ameliorated by treating for about 10–20sec in a freshly prepared

solution of:	
100vol hydrogen peroxide	1 part
Water	10parts
Rinse and dry.	

#### Selective destruction of cyan

Sodium dithionate	3·0g
Sodium bicarbonate	3·0g
Water	1000·0ml

Solution stable for 8hr.

For use by immersion, dilute with 2–3 parts water.

Total destruction of cyan is achieved in 2–3min at 22–24° in the concentrated solution.

Wash 10min and dry.

#### Total image bleach

Vanadium trichloride	1–5g
Hydrochloric acid 6%	100ml

This solution keeps for several days in well sealed bottles. Before use, pour 20ml of this solution into a small receptacle and add 5–10 granules of pure zinc. The solution can be used until its colour has turned purple. Destruction of the dyes is total after 1min.

Sponge off the excess solution and moisten the print with the 6% hydrochloric acid; wash 10min and dry.

*(These formulae are derived from Technical Brochure No 23 of Ciba-Geigy Photochimie.)*

### REDUCTION OF CONTRAST

A method of contrast reduction of Cibachrome Print material by the use of a soft-working black and white developer has been described by R. N. Harvey and M. E. Osman of the Agricultural Research Council, Weed Research Organisation, Begbroke Hill, Yarnton, Oxford, England (*The British Journal of Photography*, p 367, 29 April 1977), as follows: Since Ilford Cibachrome developer is basically a ‘PQ’ developer, it was decided to replace it with one of ‘soft-working’ characteristics. The former type of developer usually contains a super-additive combination of developing agents, Phenidone or metol with hydroquinone; the latter type more generally a single one, principally metol or Phenidone. After trying several formulations, a two-part metol-only developer was found to give good results, showing significant reduction in image contrast.

The developer consists of:

#### Part A

Metol	12g
Sodium sulphite anhydrous	50g
Distilled water	1000ml

#### Part B

Sodium carbonate anhydrous	75g
Potassium bromide	2g
Distilled water	1000ml

Mix 1 part **A** with 1 part **B** and 10 parts water. When made up, the respective separate solutions will keep indefinitely.

No difficulty should be experienced either in obtaining chemicals, or preparation of the solutions, providing one has access to an accurate chemical balance. In addition, the cost of the working solution is negligible when compared with Ilford Cibachrome developer, and the indications are that this formula will work equally well with P–18 chemistry.

Optimum development time was arrived at by developing a piece of material (fogged to white light), for the minimum time necessary to ensure that the exposed silver in the bottom layer of the material was completely developed, thus ensuring complete bleaching of the cyan dye in this layer. It follows from this, that underdevelopment will result in a cyan cast while overdevelopment will produce undesirable contrast gain.

In our case, the developer dilution rate of 1+1+10 water was chosen to give an optimum development time equal to that of the original Ilford Cibachrome developer (4min at 85°F in process P-10). In practice, we have found that a speed loss of one stop is to be expected when using this developer with CCPD-182 in the P-10 process. There is also a colour shift of -45Y, which under our conditions of use reduces the enlarger filter pack to near zero for all batches of materials yet received.

The general overall impressions of the results obtained with this modified one-shot P-10 chemistry, is that a higher percentage of prints now visibly match their respective transparencies. A visual comparison of step wedges prepared by the two processes shows a significant increased tone range in the metal developed image, and examination of the characteristic curves shows that this increase has taken place largely in the higher two-thirds of the density range, retaining highlight contrast.

## EKTACHROME 14RC IMPROVED

### Introduction

The positive/positive photographic print process has long remained a poor relation, compared with the negative/positive. Mainly used by the professional, who works it via the expedient of an internegative or even through colour separations (Dye Transfer), it was not within the reach of the average amateur. The breakthrough of Cibachrome and the very warm welcome which colour photographers gave it, certainly contributed to taking the mystery out of positive/positive, a development which did not succeed at that time in giving an impulse to the vintage Kodak Ektachrome paper, already known for more than a decade. The appearance in 1976 of a new Kodak material, from its Chalon-sur-Saône factories, has brought fresh argument in favour of the positive/positive process. The fine qualities which we have found the paper to have, lead us to give the results of our experiments together with a processing formulary.

### Development procedure

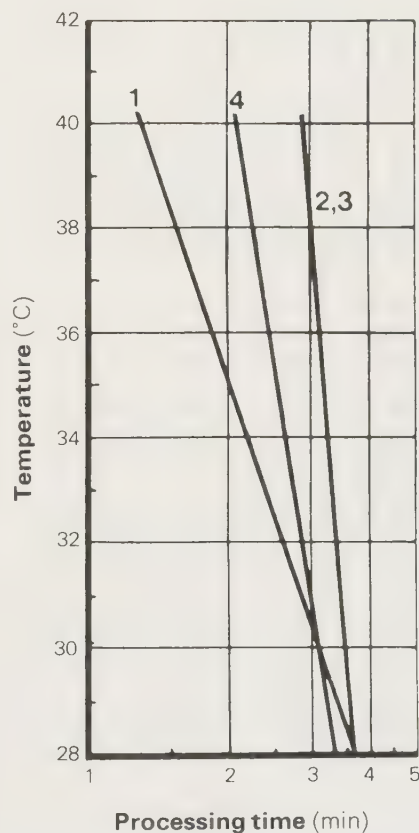
Ektachrome 14RC is a reversal colour material: the dyes necessary for the formation of the image are obtained chromogenically, in a similar way to those resulting from colour reversal film processing.

After exposure the paper is given a first, black-and-white development stage, which produces a negative silver image in the three sensitive layers. After re-exposure to light or reversal, the subsequent chromogenic development stage forms a positive colour image, without dye being produced in the silver negative areas of the print. Silver formed with the dye is removed together with the silver forming the negative image, by simultaneous oxidation, rehalogenisation and fixation, taking place in a bleach/fix bath. A final wash concludes the process, which thus requires only three baths. Our tests indicate that it is superfluous to use a stabilising bath so long as the prints are fully washed to eliminate completely any chemical products remaining in the emulsion.

14RC is a resin-coated material and so may be processed rapidly at a high temperature. This economises wash water, an advantage not to be overlooked in an age sensitive to ecological problems. The bleach/fix is non-toxic and so too minimises problems. In photofinishing houses there is, anyway, almost complete recycling: the silver is recovered and the solutions re-oxidised.

### Processing method

The development of photographic material is a reaction subject to the laws of physical chemistry and, especially, chemical thermodynamics. Hence the process is one depending on a number of parameters, with temperature by no means the least important. Readers will be fully aware that an increase in temperature speeds up chemical reactions. In black and white or colour development, the temperature coefficient is usually between 2.2 and 2.6, or a mean of 2.4. In other words, a 10° rise in temperature multiplies the speed for development by this factor or divides the development time by the same amount. For a long time colour material manufacturers imposed very strict standard temperatures, without recommending any variations. Today, the real progress which has been achieved in coating and processing techniques, has made it possible to work within a temperature range of around 10°C, and this allows adaptation of the process to individual conditions of apparatus, ambient and water temperatures, or to increase output. An increase in working temperature speeds up the development process and also increases the productivity of finishing houses. However, it is fully understood that temperature must be maintained as closely as possible during processing and this is a fundamental condition for consistent print quality.



This time-temperature diagram gives the relationship between time of immersion and temperature for the three baths and the final wash. Curve 1 refers to the first, black-and-white, development, 2 to the colour developer, 3 - identical to 2 - to the bleach-fix, and 4 to the final wash. The corrected times may be considered valid over the range 28-38°C.

As a general rule, Ektachrome 14RC may be processed between 28 and 38°C. In amateur usage, unless a proper temperature control system is available with thermostat-controlled water bath, we recommend the 28-32°C range, which it is easiest to maintain. Dish development is possible, but it is better to work using one-shot baths in a processing drum, for example, a Durst, Jobo, Paterson, Simmard or Unicolor. Besides, it is more pleasant to work in ambient light than in complete darkness and, anyway, the reproducibility of results is improved, since fresh solution is used each time.

The scheme given below applies to both dish and drum development.

Temperature:		30°		34°		38°	
		min	sec	min	sec	min	sec
1	*Pre-soak	1	—	—	50	—	40
2	B & W development	3	—	2	5	1	30
3	Wash min 4 changes	3	—	2	45	2	30
4	Re-expose	100W at 40cm, minimum 10 sec on face of paper only during last minute of wash					
5	Colour development	3	30	3	15	3	—
6	Rinse 1–2 changes		—	—	50	—	40
7	Bleach/fix	3	30	3	15	3	—
8	**Final wash	3	30	3	15	3	—

\* According to the tank or drum manufacturers' recommendations.  
\*\* Minimum of 6 changes in a drum, but preferably made in running water in a tank, washbowl, or other container.

The time/temperature graph, see opposite page, gives indications for immersion in the baths, for the adopted or necessary working temperature within a 28–38°C range.

Dish processing

*Agitation:* a slow, steady rocking motion. When finished, drain the print for 5–15sec, according to format, as it is taken out of each bath.  
*Temperature maintenance:* this is critical in the first developer: ±0.3°C. Use either a water bath, or a dish warmer, equipped with thermostat control.  
*Safelighting:* it must not be switched on. Absolute darkness is essential during first development and the first two minutes of the following wash. The subsequent steps may be carried out in normal lighting.  
*Re-exposure to light:* to be made during the last 30sec of the wash following black and white development. Only expose the emulsion side of the print to the light.

Drum processing

Working with a drum, re-exposure is carried out by taking the print briefly out of the drum. This should be kept filled with water at the indicated temperature, so that work may continue afterwards without delay.

A stop bath

Is not absolutely necessary. However, it is possible to use one between first development and the wash before re-exposure, composed of 2% acetic acid for 30sec.

Drying

After having taken the prints from the final wash in the dish or container, they should be wiped or sponged on both sides to remove most of the water, and then hung freely in the air, or in a drying cabinet; this latter appears, however, clumsy and unnecessary. In passing it may be noted that a hairdryer works perfectly well and is quite cheap. Care must be taken not to char prints by holding them too close to the outlet!

Capacity

In a drum, allow 45–50ml of black and white or colour developer for each 20×25cm sheet (500cm<sup>2</sup>). A second sheet may be treated in the same quantity of bleach/fix. In our own practice, we prefer to use double quantities of the baths, using the developers twice and the bleach/fix four times. A litre of black and white or colour developer can be used to process 1–1.1m<sup>2</sup> of paper and the bleach/fix has twice that capacity. These figures include at least a 20% safety margin.  
Working in a dish, when it will be necessary to use a relatively large amount of solution, one litre of black and white or colour developer should easily process 12–15 20×25cm sheets. The bleach/fix capacity is 2–2.5 times more. It is a good idea to work out the volume needed for the number of

prints to be processed at a time, since part-used solutions do not keep.

Keeping qualities of unused solutions:

Black and white developer: 2–3 months  
Colour developer: 2–3 months  
Colour developer, without CD-4: 2 months  
Colour developer made up: 2–4 months  
Bleach/fix made up: 1–2 months  
A and B not mixed: 3–4 months

The keeping qualities of part-used bottles is reduced by 30–50%, according to the storage conditions – darkness, well-stoppered bottles and temperature 18–20°C – and exhaustion.

Formulae

Black and white developer pH: 10.1–10.2

Phenidone	0.5g
( <i>or</i> metol: 2.0g)	
Sodium sulphite (anhydrous)	40.0g
Hydroquinone	6.0g
Sodium carbonate (anhydrous)	40.0g
Potassium bromide	1.4g
Sodium thiocyanate 20% solution	7.0ml
Potassium iodide 0.1% solution	6.0ml
Sodium hydroxide 40% solution	
<i>as required to adjust pH</i>	0.5–2ml
Water to make	1000.0ml

Colour developer pH: 10.1–10.2

Benzyl alcohol 50%	40.0ml
Hydroxylamine sulphate	3.0g
Sodium sulphite (anhydrous)	2.5g
Sodium carbonate (anhydrous)	30.0g
Potassium bromide	1.0g
6-nitro-benzimidazole nitrate 0.2%	10.0g
Sodium hydroxide 40%	
<i>as required to adjust pH</i>	2.5–3.5ml
Before use add: CD-4 (Kodak)	4.0g
Water to make	1000.0ml

A 25% CD-4 solution may be conveniently used, taking 16ml per litre

CD-4	25.0g
Potassium metabisulphite (crystalline)	2.0g
Water to make	100.0ml
	(keeps 2–3 months)

It is best to mix in the 50% benzyl alcohol first by stirring into 700ml of water before adding the solid chemicals. The 50% solution is made up:  
Benzyl alcohol 250.0ml  
Diethylene glycol 250.0ml  
Total 500.0ml

The print base whiteness may be improved by adding 5–10ml/l of a liquid optical brightener, such as Sandoz Leucophore SHR.

Bleach/fix pH: 7.0–7.2

Solution A:	
EDTA acid	6.0g
EDTA NH <sub>4</sub> Fe <sup>11</sup>	60.0g

(see note below)

Potassium iodide	2.0g
Ammonia 33%	
as required to adjust pH	12–14ml
Water to make	500.0ml
Solution B:	
Ammonium thiosulphate (crystalline)	120.0g
Potassium metabisulphite (crystalline)	5.0g
Water to make	500.0ml

In use take 1 part A with 1 part B. The pH of this bath when ready to use should be between 6.5 and 6.8. Any adjustment necessary can be made with ammonia or 20% acetic acid.

The ferric-ammonium salt of EDTA is much more easily soluble than Sequestrene NaFe, but the latter may be substituted and costs rather less.

### Conclusions and general notes

With the alternative formulae given we have obtained excellent colour prints, comparable with those from the makers' own solutions.

Ektachrome 14RC Improved has better thermal stability than its predecessor. It may be kept for 1–2 months in an ambient temperature of 18–25°C without its characteristics being noticeably changed. Nevertheless, it is advisable, as far as possible, to keep it at a lower temperature, around 10°C, or even in a deep freeze, –18° to –22°C, which gives it a life expectancy of up to a year. Do not forget that the main enemy of photographic material is damp. On taking the boxes from deep freeze or refrigerator, let them temper for 2–4hr before opening, so as to avoid the formation of condensation.

Exposure latitude has been improved compared with the earlier paper and a 6–12sec bracket gave acceptable prints, when the true exposure was 8sec. However, 4sec gave marked under-exposure. These tests were carried out with a low contrast transparency.

14RC Improved has greatly increased speed: it is about ten times that of Cibachrome – a fact which can sometimes be inconvenient, especially for small and medium size prints. For instance we found it necessary to work with the following exposure conditions when enlarging an Ektachrome 35mm transparency on to a 20 × 25cm paper: using a Chromega B enlarger with dichroic head and a 48mm Arignieux lens, a 6sec exposure at f/11 with 20Y 20M filtration was required, compared with 14sec at f/5.6 with 50Y 10C filtration for Cibachrome.

The colour balance is very satisfactory, approaching that of Cibachrome. Visual contrast seems to us slightly lower than on the earlier RC 14. As regards definition, image sharpness, although entirely acceptable, it is not as good as Cibachrome.

In short, our view is that the Ektachrome 14RC Improved paper provides a first class material for positive/positive printing, easy to handle, simple to process, whose rendition will satisfy many amateur enthusiasts looking for a material with a good quality to price balance.

At the moment, the paper is available in two surfaces: smooth glossy, and satin.

## NEW PROCESSES

Although the following are well-established commercially, and both manufacturers' kits and processing are available, neither official nor substitute formulae had been published at the time of going to press

### Colour reversal films

Kodak Ektachrome E-6

### Colour reversal papers

Cibachrome P-3 and P-12

Information on new processes is published as it becomes available in *The British Journal of Photography*.

## REFERENCES

The majority of the formulations given in the colour processing sections derive from independent investigations by Ernest Ch. Gehret and were originally published in *The British Journal of Photography*. The author has here brought these up to date as the materials have evolved. The principal references are:

### Reversal colour processing

Agfachrome 50S/50L, 2 February 1974

Ektachrome E3, 25 April 1969

GAF 64, 100, 200, 500, T/190, 11 March 1966

Orwochrom UT18 and UT21, 28 February 1966

Peruchrome C18, 9 September 1960

### Colour negative films

Kodacolor X, Ektacolor Professional, 13 February 1959 and 15 July 1960

Kodacolor II, 12 July 1974

### Colour print papers

Ektacolor 37RC, 11 January and 28 June 1974

### Colour reversal papers

Cibachrome Print, 26 December 1975

Ektachrome 14RC Improved, 15 April 1977.









